Final Report

Treatability Study Phase 2 Technical Memorandum Cooling Water Canal (SWMU No.5) Peñuelas, Puerto Rico

Prepared for

Peñuelas Technology Park LLC
Peñuelas, Puerto Rico

A Wholly Owned Subsidiary of The Dow Chemical Company

EPA Facility I.D. No. PRD980594618

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Contents

Appendixes

Tables

Figures

Acronyms and Abbreviations

BERA	Baseline Ecological Risk Assessment
BMP	best management practice
CH_4	methane
cm	centimeter
cm/d	centimeters per day
cm/hr	centimeters per hour
CMS	Corrective Measures Study
CO_2	carbon dioxide
COC	Constituent of Concern
CSA	CSA International, Inc.
CWC	Cooling Water Canal
CY	cubic yard
EPA	U.S. Environmental Protection Agency
GC/MS	gas chromatograph/mass spectrometer
GPS	global positioning system
ILFA	Industrial Landfill Area
mg/L	milligrams per liter
msl	mean sea level
NADAS	Navigation and Data Acquisition System
NAPL	non-aqueous phase liquid
NTU	nephelometric turbidity unit
PAH	polycyclic aromatic hydrocarbon
PRDNRA	Puerto Rico Department of Natural Resources and Environmental
PTPLLC	Peñuelas Technology Park LLC
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation

RSL	Regional Screening Level
RWEC	Right Way Environmental Contractors, Inc.
SWMU	Solid Waste Management Unit
SVOC	semivolatile organic compound
TS	Treatability Study
TSS	total suspended solids
TSWP	Treatability Study Work Plan
UCCLLC	Union Carbide Caribe LLC
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
°C	degrees Celsius
µg/L	micrograms per liter

SECTION 1

Project Description

This report summarizes the field activities conducted during the Phase 2 pilot studies from February 27, 2012, until March 2, 2012, at the Cooling Water Canal (CWC), designated as Solid Waste Management Unit (SWMU) No. 5, at the Peñuelas Technology Park LLC (PTPLLC) site, formerly the Union Carbide Caribe, LLC (UCCLLC) site, in Peñuelas, Puerto Rico. **Figure 1-1** presents a facility location map.

1.1 Background

The former UCCLLC operated a petrochemical manufacturing plant on the site from 1959 through 1985; the plant has since been decommissioned. The site includes a main plant process area (referred to as the Main Plant Area) where manufacturing and chemical processing facilities were located. Over the past 20 years, nearly all of the buildings, plant process equipment, and utility infrastructure systems on the plant site have been removed, demolished, or abandoned in place.

The manufacturing facility site occupied approximately 633 acres of low-lying land. While in operation, the plant produced olefins (ethylene and propylene), butadiene, polyethylene, aromatics (benzene, toluene, xylene, cumene), ethylene glycol ethers, butanol, acetone, phenol, and a phenolic derivative (bisphenol-A). Dripolene, commercially known as pyrolysis fuel, was produced as a byproduct residue of the furnace cracking reactions used to produce ethylene. The dripolene was removed from the production stream and disposed of in the Industrial Landfill Area (ILFA), which includes the Industrial Landfill (SWMU No. 20) and the Dripolene Pond (SWMU No. 15), located to the north of the CWC (SWMU No. 5).

The CWC is designated as SWMU No. 5 in the Resource Conservation and Recovery Act (RCRA) Part B Permit for the facility because of the presence of contaminated sediments in the canal. Sediments in the CWC are contaminated mainly with semi-volatile organic compounds (SVOCs), including several polycyclic aromatic hydrocarbons (PAHs), as a result of past site operations. A U.S. Environmental Protection Agency (EPA)-approved Baseline Ecological Risk Assessment (BERA) conducted in 2005 (CH2M HILL, 2006) indicated that SVOCs in canal sediments could pose an elevated risk to ecological receptors, including protected species. The final RCRA Facility Investigation (RFI) Report was submitted to EPA in February 2012 (CH2M HILL, 2012) and is awaiting final EPA approval.

1.2 Treatability Study

A Treatability Study (TS) was initiated to evaluate treatment and containment technologies being considered for the canal sediments, and to address whether the

Legend

- UCCLLC Property Boundary
- Facility Boundary

Sources:
1. Sample Points: CH2M HILL, 2008
2. Aerials: USDA, 2007

North

0 500 1,000 2,000
Feet

FIGURE 1-1
Facility Location Map
SWMU No. 5, Treatability Study Phase 2 Technical Memorandum
PTPLLC, Peñuelas, Puerto Rico

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technologies can achieve agreed-upon remedial goals. A Final Treatability Study Work Plan (TSWP) was prepared (CH2M HILL, 2011a) to be consistent with the *RCRA Corrective Measures Study (CMS) Work Plan for Cooling Water Canal (SWMU No. 5),* (CH2M HILL, 2008a). The draft TSWP was conditionally approved by EPA in October 2011 and the final TSWP was submitted to EPA in November 2011. The TSWP describes the following Phase 1 and Phase 2 activities:

- Phase 1 field activities (2009) included hydrographic and geophysical survey, groundwater flux investigation in the canal, sediments and pore water sampling for baseline characterization and bench scale studies.
- Phase 2 field activities (2012) included pilot scale deployment of three types of caps and backfilling in the portion of canal to evaluate construction feasibility using best management practices (BMPs) and construction monitoring methodologies.

Data collected from these studies will be used to optimize design and operating conditions to support the CMS remedy definition and selection processes (planned for 2012). An internal report was prepared to document the Phase 1 study results (CH2M HILL 2011b). This Phase 2 report presents the data collected from Phase 2 field activities. Both reports will be appended to the CMS report.

1.3 Site Description

The CWC is an open channel, a portion of which is navigable, running along the west side of the former manufacturing area of the PTPLLC site, and exiting to Tallaboa Bay to the south. **Figure 1-2** shows the SWMU No. 5 project location and layout. The CWC is approximately 3,000 feet long and ranges in width from approximately 50 feet at the northern end to more than 300 feet at the southern end. Water depth of the CWC normally ranges from less than 3 feet at the northern end to approximately 16 feet at the southern end. The banks of the CWC are nearly vertical and are mostly vegetated by mangroves. Seasonal precipitation and tidal fluctuations control the direction and rate of flow in the canal. A paved vehicle bridge crosses the canal approximately 400 feet south of the northern end, and a pipe rack crosses the canal approximately 800 feet north of the southern end. The site topography is flat with little relief, with land surface elevations typically less than 10 feet above mean sea level (msl). Access to the CWC is via a paved road and a boat dock along the eastern bank, and a vehicle bridge near the northern end.

North

0 250 500 1,000

Scale in Feet

FIGURE 1-2
Project Location
SWMU No. 5, Treatability Study Phase 2 Technical Memorandum
PTPLLC, Peñuelas, Puerto Rico

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ES021811083042GNV PTPLLC_F1-2_SWMU_5_Location_rev2.ai

1.4 Phase 2 Field Activities

Phase 2 pilot scale studies were conducted as a part of the TS from February 27, 2012, until March 2, 2012. Field restoration activities were completed on June 15, 2012.

1.4.1 Objectives

The primary objectives of the Phase 2 pilot study field work, in accordance with completed plans to support the TSWP and CMS Work Plan, were as follows:

1. Evaluate viability of backfilling with caliche for the containment of CWC sediment
2. Evaluate deployment and constructibility of sand and reactive material caps (Reactive Core Mat™ [RCM] and AquaBlok®) in the CWC
3. Evaluate the ability of turbidity curtains to control re-suspended sediment migration
4. Evaluate construction monitoring techniques

These objectives required the following major steps in the field:

- Sampling and laboratory analysis of locally available sand and caliche to demonstrate that these materials do not contain unacceptable concentrations of constituents that would render them unsuitable for use during the full-scale remedy implementation at the CWC
- Mobilization of CH2M HILL and subcontractor personnel, equipment, and materials to the site
- Set-up of site controls, support zone, sediment/erosion control measures; removal and storage of existing fences in the work area for replacement after the field work; and manatee watch
- Clearing of mangroves within the areal extent allowed by the U.S. Army Corps of Engineers (USACE) Nationwide Permit (**Appendix A**) and preparation of temporary access road and truck turnaround area
- Preparation of staging areas for caliche, sand, RCM, AquaBlok®, sampling and other materials and equipment, and settlement gauge for backfill test
- Procurement and delivery of caliche, sand, RCM, and AquaBlok® materials to the site
- Performance of surface water sampling for background and operational monitoring and sample shipment to Lancaster Laboratories; field measurements of turbidity, groundwater elevation, tidal elevation, groundwater flux, and gas ebullition testing

1.4.2 Phase 2 Field Study Area Description

The Phase 2 field study area (see **Figure 1-3**) is in the northern part of the CWC between transects 0+00 and 8+00. This part of the CWC is shallower and more contaminated than the southern part. BMPs were used during pilot scale studies to minimize environmental disturbances. BMPs employed included turbidity curtains to control suspended solids

migration and a manatee net to prevent collisions with or injuries to manatees during this work.

North

0 200 400 600 800 1,000

Approximate Scale in Feet

LEGEND

Phase 2 Activities

FIGURE 1-3

Plan of Field Study Area

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PTPLLC, Peñuelas, Puerto Rico

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1.4.3 Phase 2 Subcontractors

The following subcontractors supported the Phase 2 field studies:

- CSA International Inc. (CSA), Stuart, Florida

  This marine science firm conducted pre-cap and post-cap surveys of the canal, using side-scan sonar and high-definition bathymetry to obtain information on the physical placement of the cap materials and sediment displacement. CSA also assisted CH2M HILL in conducting the gas ebullition testing and in collecting data during field activities to verify cap thicknesses during cap placement.

- Right Way Environmental Contractors, Inc. (RWEC)

  This civil works contractor has the license, expertise, experience, and capability to execute civil work. RWEC mobilized a barge, tugboat, long-reach excavator, backhoe, bulldozer, and other supporting equipment and personnel to support backfilling tests, hauling fill and sand material to the site from the stockpiles, and placing the various sediment caps in the canal from the barge. In addition, RWEC assisted in the construction of a decontamination pad, temporary removal and replacement of a fence, procurement and installation of turbidity curtains, and site restoration activities. Key personnel from RWEC and their lower-tier subcontractors (barge and barge operator) were experienced and qualified to perform specialized services such as operating a barge and push boat, long-reach excavator, backhoe, bulldozer, and dump trucks as outlined in the their scopes of work.

- Lancaster Laboratories, Inc., Chicago, Illinois

  To maintain consistency and quality, this analytical testing firm performed analysis of environmental samples under an existing contract for this site.

SECTION 2

Canal Survey

CH2M HILL subcontracted CSA to assist with Phase 2 field activities conducted from February 27 to March 2, 2012. CSA's primary role was to perform pre-cap and post- cap installation bathymetry and side scan sonar surveys.

2.1 Bathymetry

2.1.1 Purpose and Scope

Pre-cap and post- cap installation bathymetric surveys were performed to define changes in the underwater topography in the canal. These surveys were conducted as a part of construction monitoring to determine the changes in the subaqueous surface elevations after cap installation and to indirectly measure the thickness of the caps installed.

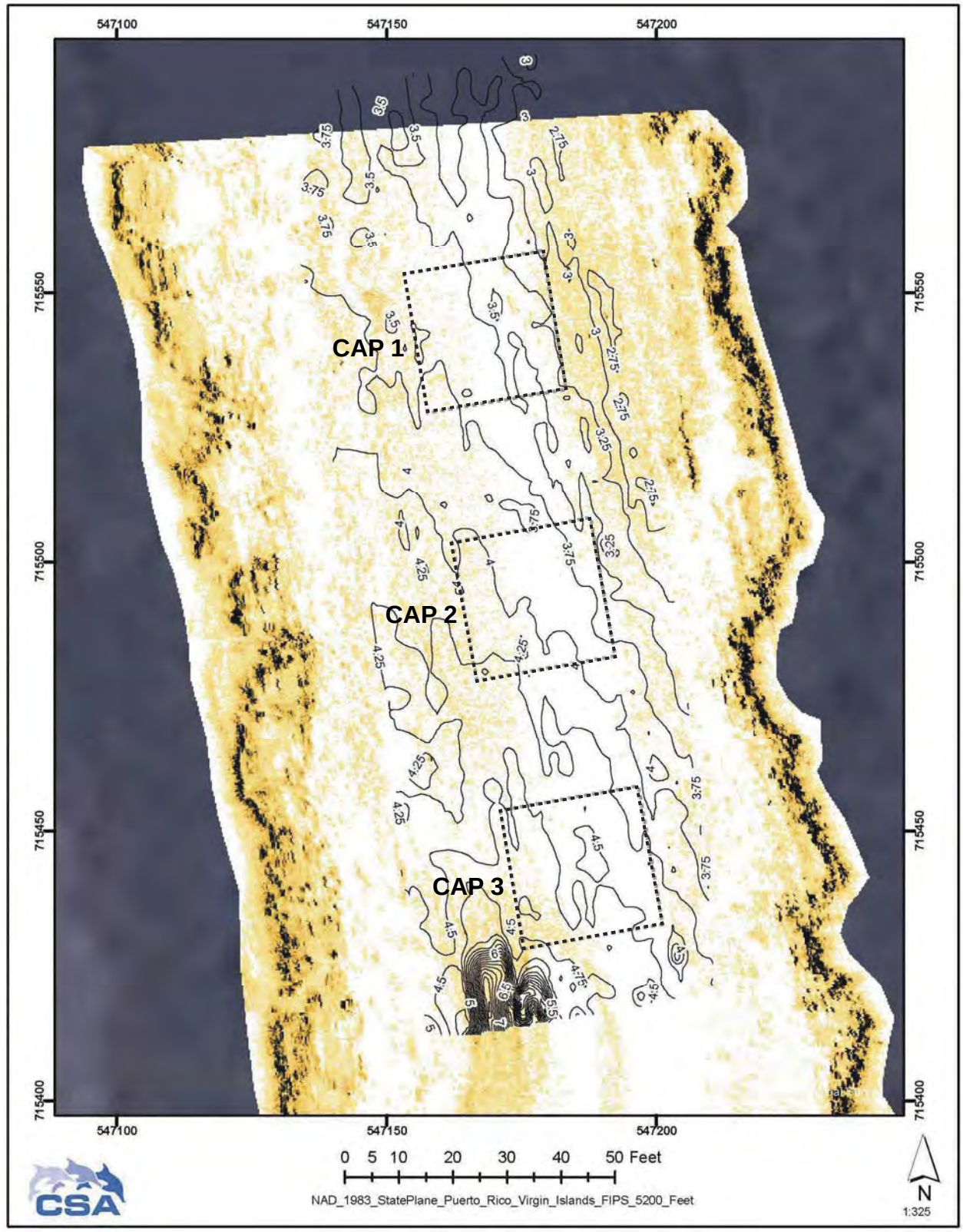
2.1.2 Equipment

An Odom Echotrac MKII precision survey echosounder system interfaced with Coastal Oceanographic's Hypack software was used for the bathymetric survey. A 200-kHz transducer was connected to the topside system to collect high resolution depth data. The echosounder system was also interfaced with CSA's Navigation and Data Acquisition System (NADAS) to assist with vessel positioning during the survey. Bathymetric data were processed with Coastal Oceanographic's Hypack software and analyzed to identify and correct navigation and depth errors. The details of data processing and data correction are provided in the report provided by CSA (CSA, 2012), a copy of which is included in **Appendix B**.

2.1.3 Results

Bathymetric surveys were conducted before and after installation of the caps. **Figure 2-1** shows the pre-cap installation bathymetric survey and the corresponding pre-cap installation side-scan sonar image (discussed in Section 2.2). **Figure 2-2** shows the post-cap installation survey and the corresponding post-cap installation side-scan sonar image (discussed in Section 2.2). Figure 2-2 also illustrates planned versus actual cap locations.

These figures depict the changes in elevation that occurred between the pre-cap installation bathymetric survey and the post-cap installation bathymetric survey. For the 1-centimeter (cm) CETCO RCM with 1 foot of sand, the bathymetric data showed an average elevation increase in the range of 0.25 to 0.5 feet. For the 6-inch AquaBlok cap with 1 foot of sand, the bathymetric data showed an average elevation increase in the range of 0.25 to 1.25 feet. For the 2-foot-thick sand cap, the bathymetric data showed a range of elevation increase from 0.25 to 0.75 feet.



LEGEND

Planned cap installation areas

FIGURE 2-1

Pre-Cap Installation Survey

SWMU No. 5, Treatability Study Phase 2 Technical Memorandum

PTPLLC, Peñuelas, Puerto Rico

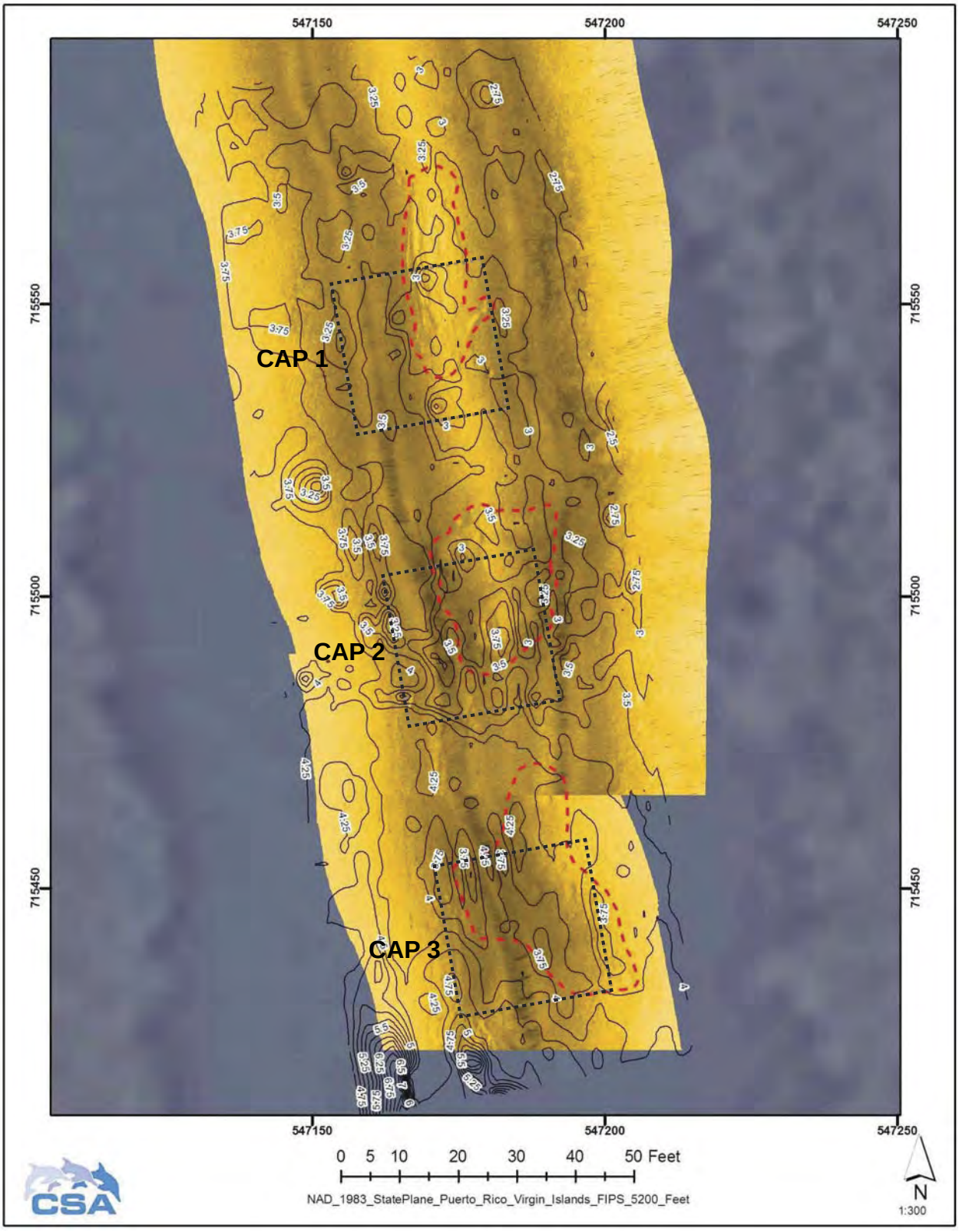


FIGURE 2-2
Post-Cap Installation Survey
SWMU No. 5, Treatability Study Phase 2 Technical Memorandum
PTPLLC, Peñuelas, Puerto Rico

2.2 Side Scan Sonar

2.2.1 Purpose and Scope

A side-scan sonar survey was performed to supplement the bathymetric survey with general subaqueous bottom images to compare the canal bottom before and after cap installation.

2.2.2 Equipment

Side-scan sonar data were collected with a Klein 3000 dual frequency digital imaging side-scan sonar system using Klein's SonarPro software. The side-scan sonar system was interfaced with CSA's NADAS to assist with vessel positioning during the field survey. Slant range for the side-scan survey was set at 25 meters, with a resulting swath width of 50 meters. In addition, a Humminbird 1198c bathymetry/side-scan sonar system was used to collect data for comparison with the Klein 3000 system. Chesapeake's SonarWIz software was used to post-process the side-scan sonar data files. The details of data processing and data correction are provided in the report submitted by CSA (CSA, 2012), a copy of which is included in **Appendix B**.

2.2.3 Results

Figure 2-1 (presented previously) shows pre-cap installation side-scan sonar image and Figure 2-2 (presented previously) shows the side-scan sonar post cap installation images for CETCO RCM, AquaBlok, and sand cap areas. Figure 2-2 illustrates the location of planned and actual cap locations. All the placed cap locations were observed to be shifted approximately 20 feet to the northeast from the planned locations. The side-scan sonar provides an image of canal bottom surface and shows some features of the installed cap. The folding of the RCM, impressions of buckets in the sediment for the AquaBlok and sand caps, and the propeller scour areas are noteworthy.

SECTION 3

Field Tests and Water Level Measurements

3.1 Seepage Flux

Seepage flux (sediment pore water flux to canal surface water) was investigated to evaluate potential for contaminant migration from sediment pore water. These data serve to evaluate the long-term ability of the cap design to chemically isolate the contaminants and maintain water quality and sediment cleanup levels. Seepage flux is also an issue when considering impermeable cap function.

3.1.1 Purpose and Scope

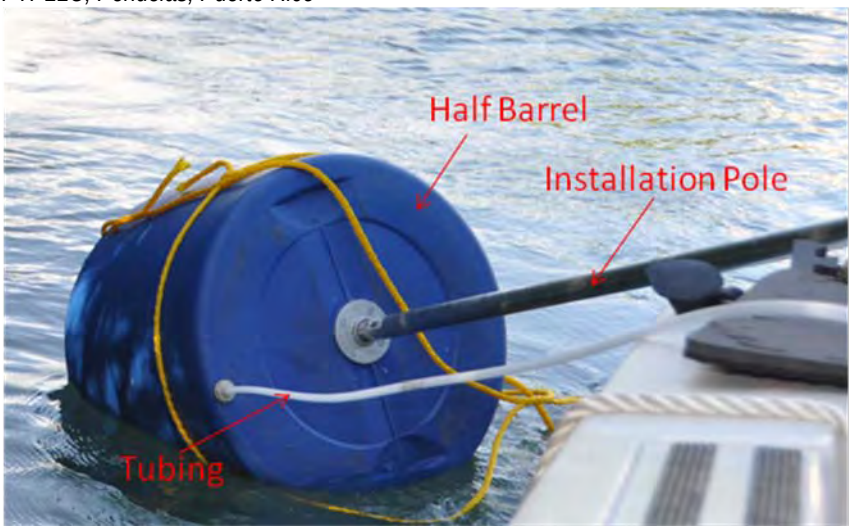
Half-barrel seepage meters were deployed to measure the seepage rate of water/ groundwater flux across the sediment-water interface in the canal. Groundwater flux indicates the advection rate at which contaminants can pass through the sediments and permeable portions of the cap into the canal. The groundwater flux and pore water concentrations are used in sediment cap models to predict the performance life and required thickness of selected reactive material cap.

3.1.2 Equipment and Procedure

The seepage meters were constructed from plastic barrels cut in half and tubing mounted near the edge of the barrel bottom. An outlet vent was fitted to the closed end (lid) to allow a water collection bag to be attached with flexible tubing. Prior to installation, the water collection bag was filled with 1 liter of site water to measure potential loss of water (downward gradient) or evaluate net gain from seepage. The seepage meters were deployed by inserting the open end down into the bottom sediments and allowing the water inside the meter to equilibrate with the surface water. A flange was fitted to the bottom center of the barrel to push seepage meters down into the mud. **Figure 3-1** shows the picture of seepage meter assembly.

The seepage meters were installed and tested from February 25 to February 29, 2012, during Phase 2 field activities. **Figure 3-2** shows the locations where attempts were made to deploy the seepage meters.

Figure 3-1
Seepage Meter Assembly
PTPLLC, Peñuelas, Puerto Rico



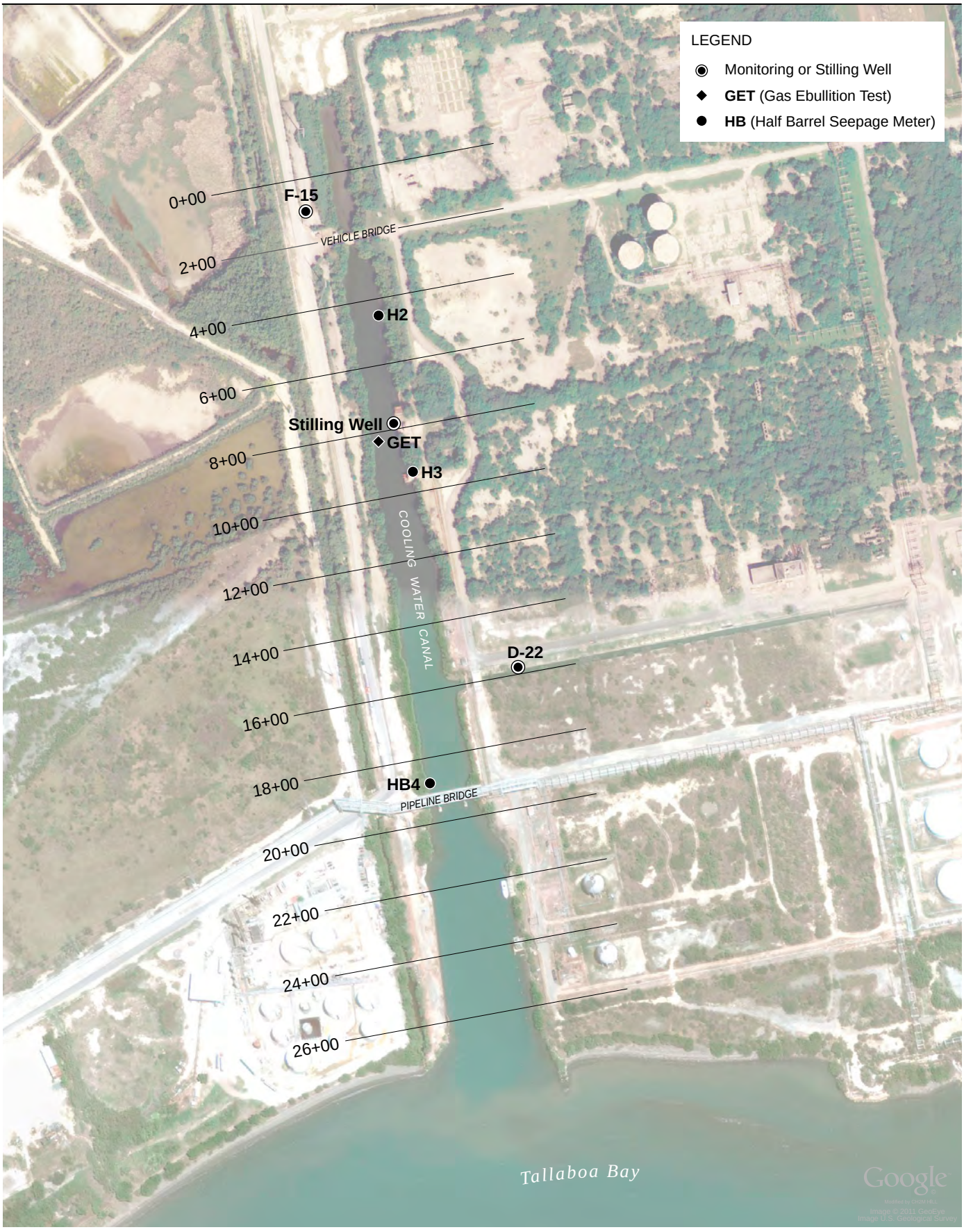
3.1.3 Results

During Phase 2 field work, only one seepage meter (HB2) was successful in obtaining readings for a longer duration than was obtained in Phase 1, and showed that the weight of the water collection bag increased and then decreased. The results are presented in **Table 3-1**. The results for HB2 indicated upward flux of 0.001 centimeters per day (cm/d) in the first 72 hours, followed by – 0.0139 cm/d in the following 48 hours. This positive upward flux followed by negative downward flux can be attributed to the tidal action. The other two attempts were abandoned mid-study because one seepage meter was pushed up by the barge and insufficient time was left to reinstall the meter (HB3); the other meter was found floating (HB4), assumed to be the result of natural buoyancy.

TABLE 3-1
Seepage Meter Survey Details
PTPLLC, Peñuelas, Puerto Rico

Seepage Meter	Coordinates		Time Record					Results
	Latitude (N)	Longitude (W)	Start Date	Start Time	End Date	End Time	Estimated Elapsed Time (hours)	Flux (cm/d)
Set 1								
HB2	17 59.787	-66 44.814	2/25/2012	16:50	2/28/2012	14:40	72	0.0010
HB3	17 59.709	-66 44.799	2/27/2012	16:50	2/29/2012	15:45	48	0.0001
HB4	17 59.551	-66 44.787	2/27/2012	17:45	2/29/2012	NM	NM	
Set 2								
HB2	17 59.787	-66 44.814	2/28/2012	16:30	3/1/2012	14:40	48	-0.0139

Notes:
cm/d = centimeters per day
NM = Not measured



North

0 400 800

Approximate scale in feet

FIGURE 3-2
Well and Test Locations
SWMU No. 5, Treatability Study Phase 2 Technical Memorandum
PTPLLC, Peñuelas, Puerto Rico

3.2 Gas Ebullition Test

Sediments rich in organics can generate gases such as methane (CH_4) and carbon dioxide (CO_2) as a result of anaerobic and aerobic processes. These gas bubbles are inherently hydrophobic and tend to accumulate and transport hydrophobic constituents of concern (COCs) into the water column (Chattopadhyay, et al., 2010). Gas ebullition also increases the potential for particle re-suspension and pore water diffusion due to channeling. This can increase contaminant diffusion even at sites with no groundwater seepage (Barabas, et al., 2009).

3.2.1 Purpose and Scope

Gas ebullition can lead to cap rupture if the rate of ebullition is high, especially in the case of the impermeable AquaBlok cap. Therefore, gas ebullition testing was attempted to evaluate the presence and rate of gas that can be potentially released from sediments and can affect cap integrity, as well as transport dissolved or non-aqueous phase liquid (NAPL) contaminants into overlying water.

3.2.2 Equipment and Procedure

The gas ebullition meter was constructed with a 4-inch-diameter polyvinyl chloride (PVC) pipe approximately 18 inches long, capped with a standard PVC cap with vinyl tubing long enough to reach the water surface. The tubing was connected to a U-tube manometer mounted on a wooden board to which a ruler and a small level had been affixed **(Figure 3-3)**. The level was mounted to confirm that the board was held level when the manometer was read. Site water was added to the manometer to serve as the liquid level in the U-tube.

3.2.3 Results

After installation of the gas ebullition test assembly (see location in Figure 3-2), the tubing valve was closed and the meter was checked after 24 hours. The tubing coupling was connected to the U-tube manometer and the valve was opened to check the pressure. Opening of the valve allowed the water trapped in the tubing to equalize with the current stage of the tide. This movement of water in the manometer was at least somewhat affected by the canal water level head at the time of the reading. The tidal fluctuation was observed to be the driving force in the tubing as it moved the water column up and down. Therefore, no valid readings could be taken and this test was subsequently abandoned.

3.3 Canal Surface Water and Groundwater Levels

3.3.1 Purpose and Scope

Canal water surface levels and adjacent groundwater surface levels were measured contemporaneously relative to the survey datum to evaluate the differential head between groundwater and the canal surface water over time. The data were designed to indicate the magnitude and direction of differential head between the canal water and groundwater over time, including reversal of direction, if any.

FIGURE 3-3
Gas Ebullition Test Kit
PTPLLC, Peñuelas, Puerto Rico

3.3.2 Equipment and Procedure

The station locations for measuring water levels were selected from available nearby monitoring wells and included existing monitoring wells F15 to the north and D22 to the east of the CWC (see Figure 3-2). F15 is approximately 100 feet west of the canal, just north of the vehicle bridge. D22 is immediately adjacent (within 10 feet) of the south cooling water return lateral, which runs perpendicular and is hydraulically connected to the CWC. A new standpipe (PVC pipe) was attached to the boat dock adjacent to survey TBM No. 8; the pipe extended down into the water providing a stilling well for instrument deployment. Locations and physical information on these three stations are provided in **Table 3-2**.

The equipment used to measure the in situ water levels included Troll 700 recording transducers; these instruments measured and recorded canal and well water surfaces at 15 minute intervals continuously throughout the period they were deployed.

The in situ data loggers for water levels were installed on Saturday, February 25, 2012, at approximately 9 a.m. and were stopped on Wednesday, March 14, 2012, at approximately 9 a.m., for a total deployment of 18 days. The water level data were downloaded from the instrument's WinSitu data application into a spreadsheet for analysis and charting.

TABLE 3-2
Well Location Information
PTPLLC, Peñuelas, Puerto Rico

Point Number	North Coordinate	East Coordinate	Top Elevation	Ground Elevation	Well Description
TBM No. 8+00	NA	NA	2.57	NA	Adjacent to Stilling Well
708	58996.889	391506.922	10.50	7.90	D-22
714	60334.476	390693.993	6.54	5.42	F-15

Notes:
Per survey by Victor Seda & Associates, March 17, 2011; elevations in feet.
Stilling well is new (February 2012) installation, not the well present during the 2011 survey.
Vertical datum = approximate mean sea level
NA – Not Available

An existing rain gauge at the nearby Industrial Landfill was used to measure daily precipitation during the study. The only rain recorded in the landfill gauge during the period of water level readings was 0.85 inches on March 9, 2012; no other precipitation was recorded at this gauge from February 25 through March 14, 2012.

Historical groundwater level data in the vicinity of the CWC were reviewed to evaluate groundwater levels relative to the surface water level in the canal.

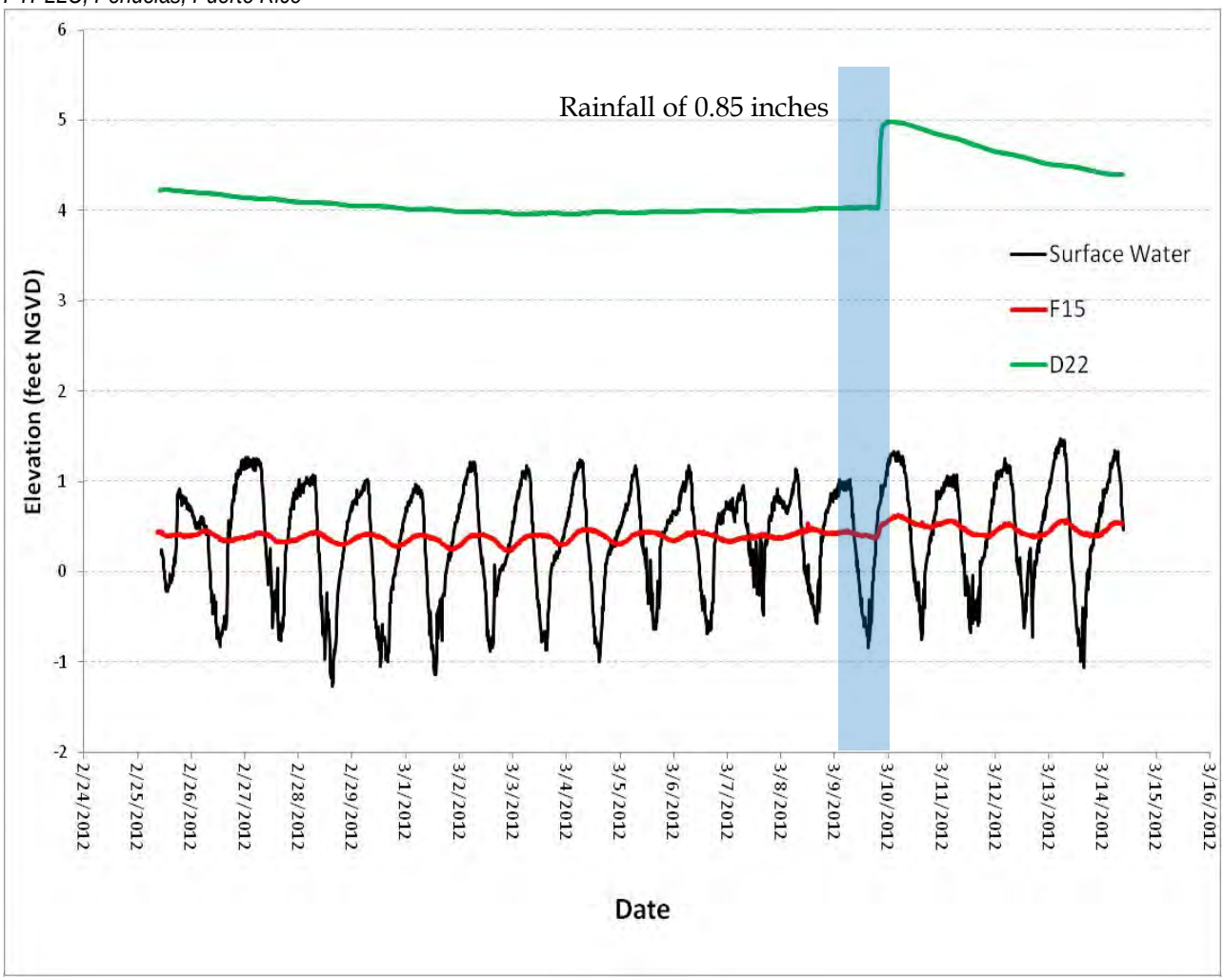
- Groundwater surface contours shown on Figure 7-4 of the Supplemental RFI report (UCC, 1988) indicated elevations at the north end of the canal (vicinity of F15) to be approximately 2.0 to 2.5 feet msl in July 1985 (prior to extraction pumping).
- Groundwater surface contours shown on Figure 2-1 of the ILFA RFI report (CH2M HILL, 2010) indicated elevations at the north end of the canal (vicinity of F15) to be approximately 0 feet in December 2007; elevations toward the southern end of the CWC (D22) were approximately 2 feet higher than F 15 levels (no datum was given).
- Subsequent groundwater data for December 29, 2011 (CH2M HILL, 2012), indicated similar trends, but with groundwater elevations in the F15 area several feet lower than in 2007.

These data suggest that over the years there has been a gradient from the CWC to the groundwater in F15 area at least some of the time, but a gradient from groundwater in the D22 area to the CWC. These flow trends are supported by the data collected in this water level study.

3.3.3 Data Evaluation

The water level versus time data are presented in chart form in **Figure 3-4**. The results show the tidal variations in the canal surface water elevation with daily highs and lows corresponding to local high and low tides. Some tidal influence is apparent in F15, with a lag of several hours after the canal tides. The average level in F15 is only slightly

FIGURE 3-4
Water Surface Fluctuation over Time
PTPLLC, Peñuelas, Puerto Rico



above the average surface water elevation in the canal. These low groundwater levels in F15 are likely influenced by the groundwater recovery system directly to the north. D22 shows a very small daily fluctuation, and a higher average water level elevation, indicating that the groundwater levels are higher in that area and less influenced by tides. F15 and the surface water showed a minor response to the precipitation on March 9; D22 showed a significant response to the rainfall.

The groundwater and surface water data collected and reviewed support the following observations:

- The differential head between groundwater and surface water at the northern end of the CWC is typically very small, but with the groundwater being up to several feet lower than the surface water in the canal, indicating that flow between the water regimes varies from very small to driving canal water to the groundwater.

- The low groundwater elevations in the F15 area are caused by the pumping effect of the groundwater extraction system, and groundwater elevations there would likely increase if the extraction system was shut off for an extended period.
- The groundwater elevation in the D22 area indicates a head differential of approximately 4 feet driving groundwater toward the canal.

SECTION 4

Environmental Considerations

Environmental provisions of the TSWP and permit included minimizing impact to the mangroves, allowing only uncontaminated materials to be placed in the canal, and minimizing the re-suspension and migration of solids during the pilot study field activities.

4.1 Material Tests

Analytical tests were performed on the caliche and sand material sources prior to delivery of these materials to the site. The results of caliche testing were presented in the TWSP and compared to the EPA Regional Screening Levels (RSLs) published in June 2011. However, the RSLs were revised in November 2011 between the TSWP submission and the implementation of the Phase 2. Therefore, the results were compared to November 2011 EPA RSLs and background metals levels from a 1992 study by the United States Geological Survey (USGS) and Puerto Rico Department of Natural Resources and the Environmental (PRDNRA) (Marsh, 1992). Arsenic and chromium exceeded November 2011 EPA RSLs but fell within the range of the Marsh background study values, and hence were considered acceptable as before.

Sand sampling results were also compared to both EPA RSLs for residential soil and the sediment background data (Marsh, 1992) and qualified similar to the caliche. There were exceedances of the EPA RSLs for arsenic and chromium but these values were within the range of background values and below the average values for arsenic and chromium in the Marsh background data. The analytical data for caliche and sand are provided in **Appendix C**.

4.2 Mangrove Removal

Clearing of mangroves on the east bank of the canal just upstream of the vehicle bridge was required to provide access for the backfill test. The areal extent of mangrove clearing was limited to 0.01 acre by the USACE Nationwide Permit. On February 27 and 28, 2012, the security fence was removed and caliche was stockpiled near the bank for use in building the access ramp and conducting the backfilling test. Significantly less than 0.01 acre of mangroves was cleared on February 29 in an area approximately 14 feet by 12.5 feet (0.004 acre) as shown on **Figure 4-1**. Disturbance to the ground and adjacent mangroves was minimized to enhance mangrove re-growth after the test.

4.3 Turbidity Control

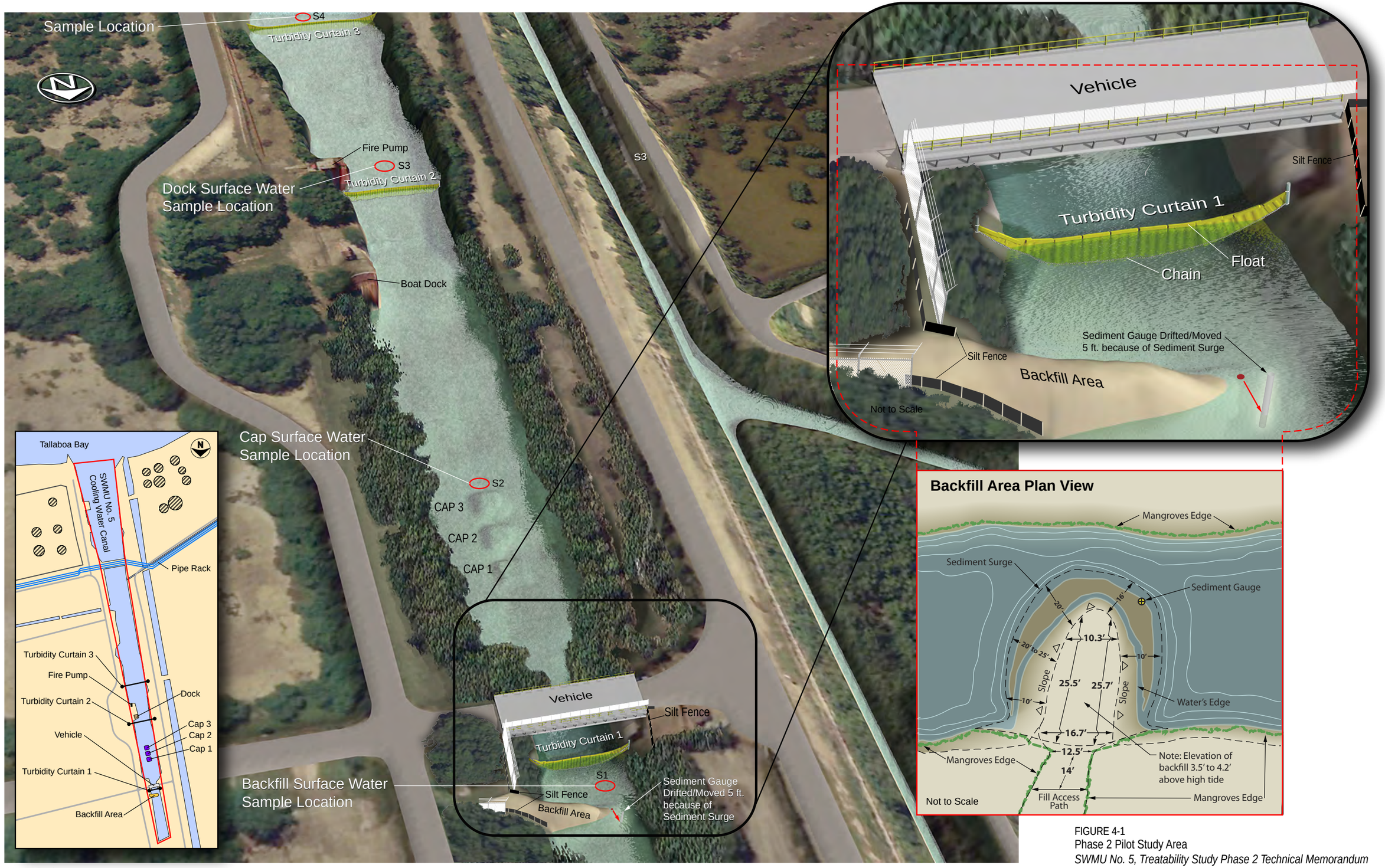
Turbidity due to the re-suspension of sediment solids was controlled by using low-energy placement techniques and turbidity curtains. Three turbidity curtains were deployed in the pilot test areas prior to the placement of cap and backfill materials in the canal to control potential migration of suspended solids. Turbidity curtain No. 1 was installed at Station 2+00 and curtain No.3 was installed between Stations 12+00 and 14+00

on February 28, 2012. Curtain No. 2 was installed between Stations 8+00 and 10+00 on February 29, 2012. The upstream (No. 1) and downstream (No. 3) turbidity curtains were deployed first to allow in-water work equipment to enter the canal and install test devices. The manatee net was installed downstream of turbidity curtain No. 3 to prevent manatees from entering work areas. Figure 4-1 shows the locations for the turbidity curtains and **Figure 4-2** presents a picture of installed turbidity curtain No. 3.

4.4 Manatee Control

Manatees are known to occur at the mouth of the canal and were observed traversing within the canal prior to intrusive activities. Protection was provided for the manatees during all elements of this pilot study occurring within the CWC. The following precautions were implemented for this field work:

- Initially, observers were deployed to watch for manatees during sampling activities, and when there was boat traffic in the canal.
- Work in the canal was stopped whenever manatees were sighted in the vicinity.
- A log was maintained to record encounters or sightings of manatees during field activities.
- A manatee net was installed on February 28, 2012, downstream of turbidity curtain No. 3 near Station 14+00. The net bridged the entire width and depth of the canal at this station to completely block manatee entry into the pilot study area during deployment of pilot study materials in the canal. No manatees were observed in the work area after net deployment.



Not to Scale

FIGURE 4-1
Phase 2 Pilot Study Area
SWMU No. 5, Treatability Study Phase 2 Technical Memorandum
PTPLLC, Peñuelas, Puerto Rico

FIGURE 4-2
Installed Turbidity Curtain No. 3 and Manatee Net
PTPLLC, Peñuelas, Puerto Rico

SECTION 5

Pilot Scale Testing

5.1 Backfilling

This test was performed to evaluate the viability of backfilling the canal with caliche for the containment of sediment. The location for the test upstream of the vehicle bridge (as shown previously on Figure 4-1) was selected for the following reasons:

- This area is the most contaminated area of SWMU No. 5 and most likely to be backfilled.
- The surficial sediments are known to be very soft.
- The vehicle bridge provides a good barrier (with turbidity curtains) to downstream migration of suspended sediment that may occur during the test.

The backfill test plan included three different placement methods for evaluation of the best approach:

1. Material would be dropped gradually into the canal from above, and around a settlement gauge to a height of 6 to 8 feet above the canal sediment bed, or to failure of the soft sediment base.
2. Material would be pushed off the canal bank into the canal around a settlement gauge either to a height of 6 to 8 feet above the canal sediment bed or to failure of the soft sediment base.
3. Material would be dropped into the water in small lifts over a larger area around a settlement gauge to gradually build up the backfill. When the top of the fill reached the water level, additional material would be pushed from the bank out onto the fill area to gradually bring the fill up to the level of the canal bank.

Variations on these procedures were to be attempted depending on the response of the soft sediment to the loads, and the limitations of the equipment.

5.1.1 Installation Process

Preparation for the backfill test was performed on February 29, 2012. Access marking for clearing and fence removal began on February 27. The access ramp was cleared of upland vegetation and mangrove saplings and trees, and an access road was constructed with clean caliche fill to reach the water's edge. The backfill testing was performed on March 1 and March 2. All clearing, grading and earthmoving for the backfill pilot test was performed with a D-4 bulldozer.

Placement methods 1 and 3 (described previously), which would spread the caliche in thin layers, required a long-reach backhoe, which was not available for these tests. Instead, using the D-4 bulldozer, two variations of Method 2 were used:

- Method 2A: direct push from the bank in 8- to 12-inch lifts and compaction with the bulldozer (track-compacted)
- Method 2B: direct push and displacement of the caliche fill without the bulldozer compaction

A cross section showing the sequence of the backfill test construction is presented in **Figure 5-1**.

For Method 2A, caliche was pushed into the water in bridging layers approximately 1 foot thick and track-compacted with the bulldozer, initially approximately 4 feet from the bank of the canal into the water. There were no disturbances to the underlying soft sediments (such as mud waves, where the soft sediment heaves upward in front of the advancing fill) with this first push. An additional 2-foot length of this layer was pushed (total of 6 feet into the water) and compacted into a "hard ramp" approximately 1 foot thick. The tracking of the bulldozer back and forth produced a mud wave approximately 5 to 6 feet beyond the leading edge of the hard packed ramp (top of ramp was approximately 8 inches above the water surface). The mud wave was approximately 1 to 2 feet high, with the top just below the water surface. Finally, another 2 feet (total of approximately 8 feet into the water) of ramp approximately 1 to 2 feet thick was pushed, leaving approximately 10 to 12 inches above water; this was track-compacted to continue the hard packed ramp. The mud wave increased and went above the water surface on the west and south sides of the ramp. At this point, use of this method ceased and no additional caliche was placed by this method.

For Method 2B, loose caliche material was pushed down the previously placed hard pack ramp in 6- to 10-inch lifts over the front edge of the ramp to create a soil mound/stockpile of loose caliche fill approximately 4 to 5 feet high. Each increment of the soil pile was pushed by the bulldozer until enough material had collapsed/cascaded forward, and then additional material was pushed to rebuild the pile and repeat the process. This mound building and ramp extension construction was done without the bulldozer tracking over the loose placement. Little change was observed in the shape or size of the mud wave produced by Method 2A. The final configuration and extent of the ramp and mud waves are presented in Figure 5-1, and a photo of the completed backfill test is shown in **Figure 5-2**.

FIGURE 5-1
Backfill Test Method 2A
PTPLLC, Peñuelas, Puerto Rico

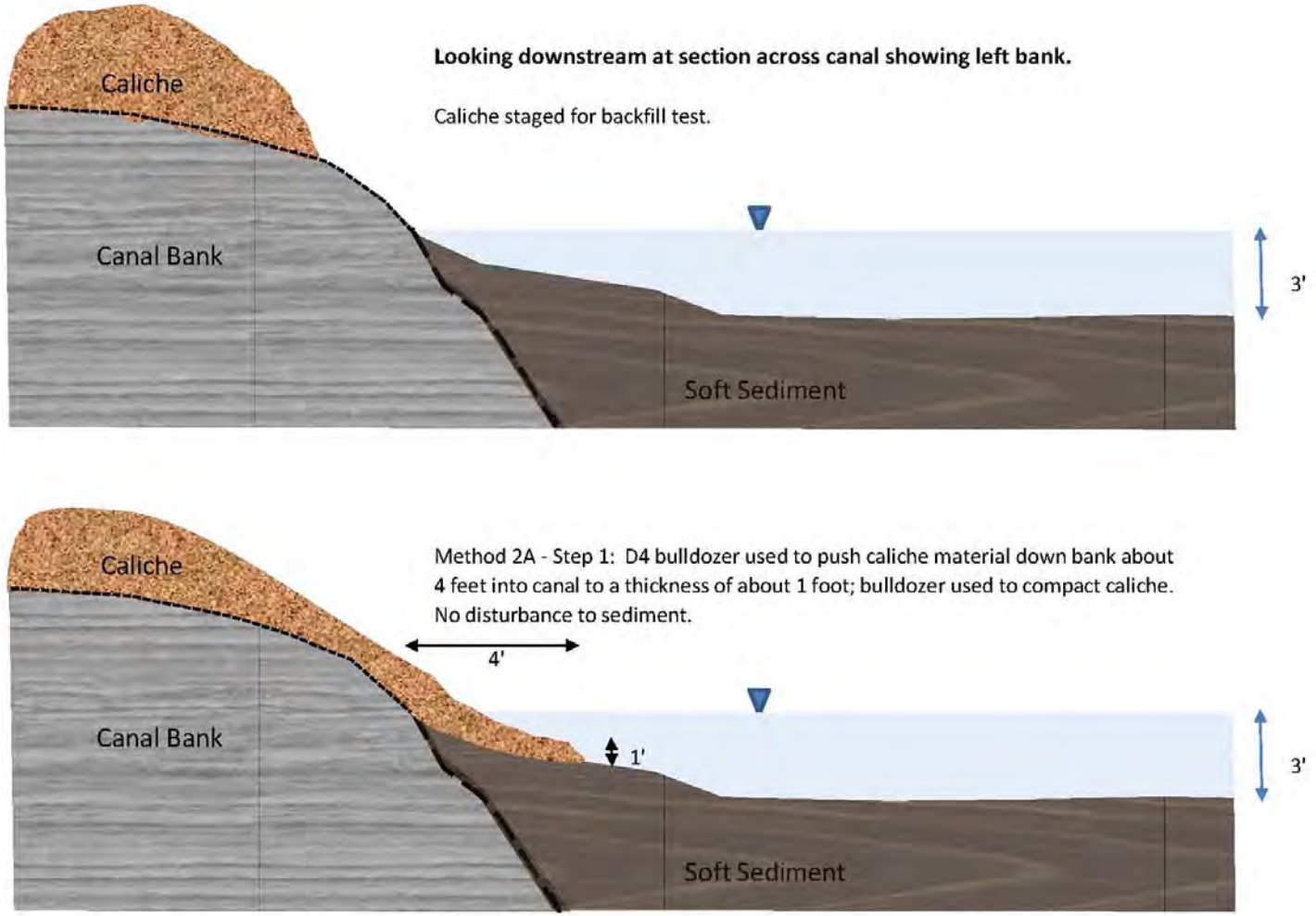


FIGURE 5-1 (CONTINUED)
Backfill Test Method 2A
PTPLLC, Peñuelas, Puerto Rico

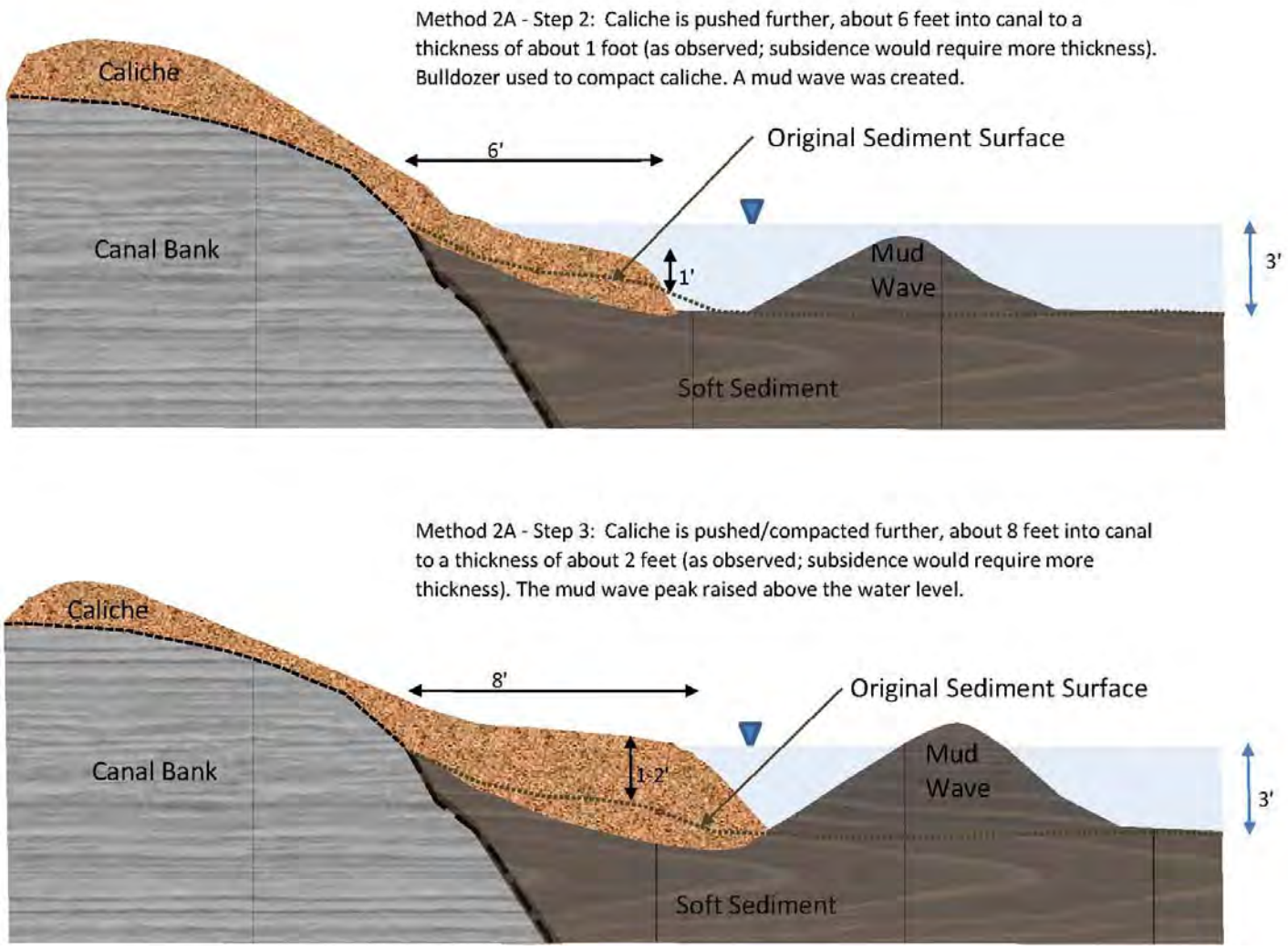


FIGURE 5-1 (CONTINUED)
Backfill Test Method 2B
PTPLLC, Peñuelas, Puerto Rico

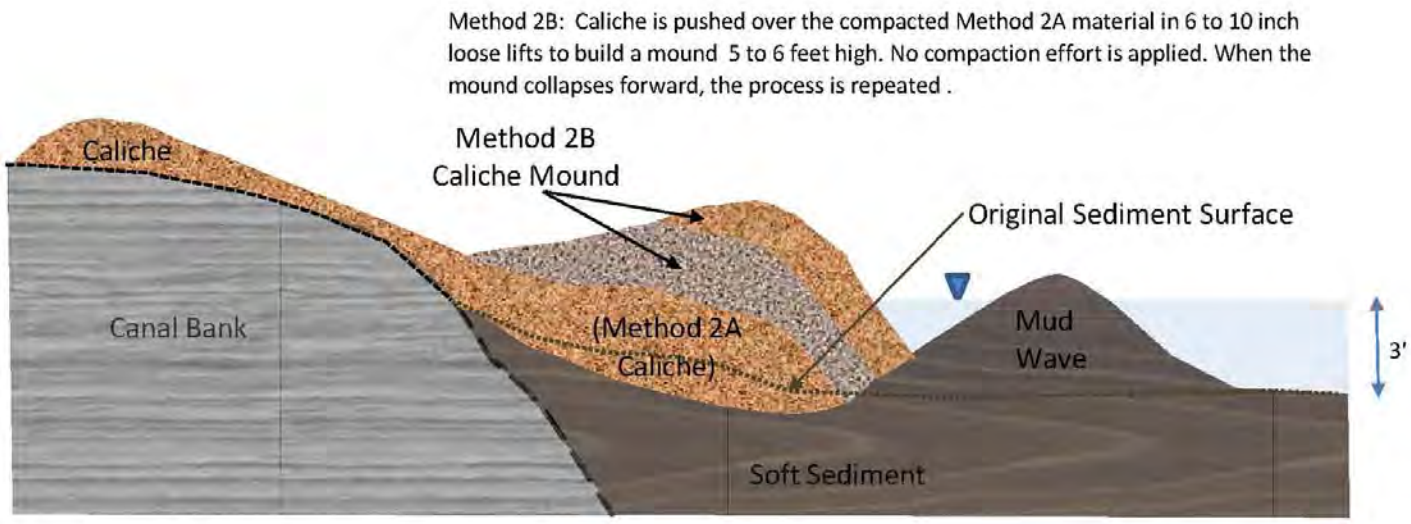


FIGURE 5-2
Photo of Backfill Test
PTPLLC, Peñuelas, Puerto Rico

5.1.2 Construction Monitoring

A sediment settling gauge was placed in the canal and anchored with sand bags at the west end of the advancing backfill. The mud/silt wave resulting from the backfill placement of Method 2A pushed the gauge to the west and north. Because the gauge was displaced laterally and at an angle, no settlement observations were made.

Additional observations after completion of the backfilling were made; no additional movement or settlement of the backfill or gauge was reported.

Throughout the backfill test operations, there were no discernible odors or visible sheens on the water surface.

5.1.3 Equipment Usage

As mentioned previously, a D-4 bulldozer was the only equipment available for this test. Additional equipment which may have been applicable included a long-reach backhoe or clamshell and crane operating from the bank or a barge, and a mechanical spreader operating from a barge. Both of these methods would likely have placed backfill material in thin lifts, minimizing mud waves (soft sediment disturbance and displacement). It was also noted that by placing material initially in thin lifts with the

bulldozer (without compaction), Method 2B may have resulted in a significant reduction of mud waves, but because the Method 2B test was conducted directly on top the Method 2A backfill, no mud wave movements could be observed directly by Method 2B.

5.1.4 Backfill Site Restoration

Backfill in the canal was left in place to be addressed as part of the final remedy. The fill material placed on the bank within the mangrove zone was removed down to natural ground to allow mangroves to re-vegetate the area. This caliche fill material and the remaining stockpile of caliche were removed to the ILFA for use in other projects. The fence was reattached to the poles and the bank and staging areas were secured and returned to pre-test conditions. Sedimentation and erosion controls (silt fence) were left in place to be removed at a future date when natural erosion controls re-establish. The restored condition on May 31, 2012, is shown in **Figure 5-3**.

FIGURE 5-3
Restored Conditions after Backfill Test
PTPLLC, Peñuelas, Puerto Rico

5.2 Cap 1 – CETCO Reactive Core Mat™

5.2.1 Cap Description

CETCO RCM with organoclay PM-199 was deployed in a planned area of 25 feet by 25 feet between transects 4+00 and 6+00, and overlain by a 6-inch layer of clean sand. The reactive organoclay material attached to the geotextile fabric has been proven to be an effective adsorbent for NAPL and low-solubility organic compounds. The overlying sand layer was added to provide a protective layer for the RCM and to provide habitat for benthic organisms. The details of CETCO cap design are provided in TSWP (CH2M HILL, 2011a).

The objective of this pilot scale cap installation was to gain understanding and practical knowledge regarding deployment requirements that need to be considered during full-scale deployment of the technology.

RCM Preparation

A 25-foot by 25-foot RCM panel was prepared on land by sewing two 25-foot-long by 15-foot-wide sections together with approximately 24 inches of overlap at the seam, using 40 pound test monofilament fishing line. Two 26-foot sections of 1-inch closed loop zinc plated chain were hemmed into the sleeves and sewn to each end of the panel to provide adequate ballast during the placement of the mat. Additionally, white floats were attached to the corners of the mat as markers. **Figure 5-4** shows the sewn RCM pad prior to deployment.

FIGURE 5-4
RCM 25-foot by 25-foot Mat
PTPLLC, Peñuelas, Puerto Rico

5.2.2 Installation Process

During installation, the RCM pad was intended to be pulled off the barge by two powered watercraft. The on-board excavator was also used, however, because the fabric proved to be too heavy for the watercraft alone. The near end of the mat was held by the barge and slowly lowered until the end reached the bottom. The RCM did not settle into a perfect square and ended up with a narrow plan at the northern end and approximately 22 feet wide at the southern end. Further attempts made to maneuver the RCM into place with the ropes were not successful. High winds also affected the exercise by making it difficult to maneuver the barge. **Figure 5-5** shows the installation of RCM.

The sand layer was placed in the test cap area in four quarter areas of about 6 to 7 feet by 25 feet each. The excavator (with a 1.48 cubic yards [CY] bucket) was used to lift and place the sand material over the water in the quarter sections. The amount and distribution of sand were estimated based on visual evaluation.

5.2.3 Construction Monitoring

Test buckets were placed at intervals as conditions allowed across the RCM prior to the placement of sand. The transparent test buckets were periodically lifted and observed to measure sand layer thickness placed. The measurement data were primarily used to provide feedback to the installation crew rather than to record cap thicknesses. **Figure 5-6** shows the layers of cap as monitored by a collection bucket during construction.

During placement of the sand, it was noticed that the corner markers drew in closer to each other; the markers at the southern end eventually were only 9 feet apart. The overall plan of the deployed RCM mat was observed (via markers) to be reduced by approximately 30 to 40 percent after sand placement was completed. The test buckets were also difficult to retrieve from the top of RCM, likely because they sank into the sand cover and underlying soft sediment.

5.2.4 Equipment Usage

The equipment used during RCM cap installation included two 24-foot outboard motorboats, a 12-foot outboard Zodiak, a 14-foot canoe, a John Deere 780 Excavator, and canal survey equipment. The global positioning system (GPS) was used to place floats at the four corners of the proposed test area to position the barge for cap installation. The barge supported the excavator, mat, and stockpile of sand. It was moved into position and the studs were dropped to hold it in position. The outboard boats were used to move staff and materials, and to assist with monitoring and sampling. The Zodiak and canoe were used for observations and staff access.

FIGURE 5-5
RCM Installation
PTPLLC, Peñuelas, Puerto Rico

FIGURE 5-6
Test Bucket Showing Sand Layer Thickness for RCM Cap
PTPLLC, Peñuelas, Puerto Rico

5.3 Cap 2 – AquaBlok Cap

5.3.1 Cap Description

The AquaBlok cap was deployed in the planned area of 25 feet by 25 feet between transects 4+00 and 6+00 to the south of the RCM cap. The AquaBlok cap consisted of two layers: a lower 1-inch-thick reactive organoclay layer, and an overlying 4-inch-thick impermeable AquaBlok layer. Organoclay provided by AquaBlok Ltd. consisted of composite aggregate technology with dense aggregate core coated with powdered organically modified bentonite clay.

The AquaBlok impermeable material consisted of aggregate with bentonite coating only. The overlying sand layer was added to provide a confining layer for the swelling clay, a protective layer for the AquaBlok, and to provide habitat for benthic organisms. The details of the AquaBlok cap are provided in the TSWP (CH2M HILL, 2011a).

5.3.2 Installation Process

The AquaBlok cap layers were placed directly from the supersacks in which they were shipped and stored. The bottom of the sack was cut open and the sack was suspended by the excavator to allow the gravel-like material to fall into the water. This was followed by placement of a 6-inch-thick sand layer, as was done with the CETCO cap installation. All the cap layers were placed in the test cap area in four quarter areas of approximately 6 to 7 feet by 25 feet each until the 25-foot by 25-foot cap area was covered. **Figure 5-7** is a photograph showing placement of AquaBlok cap material using supersacks provided by AquaBlok.

Additional sand was placed in areas where proper thickness of the cap was not achieved (based on bucket measurements) during the initial placement effort.

5.3.3 Construction Monitoring

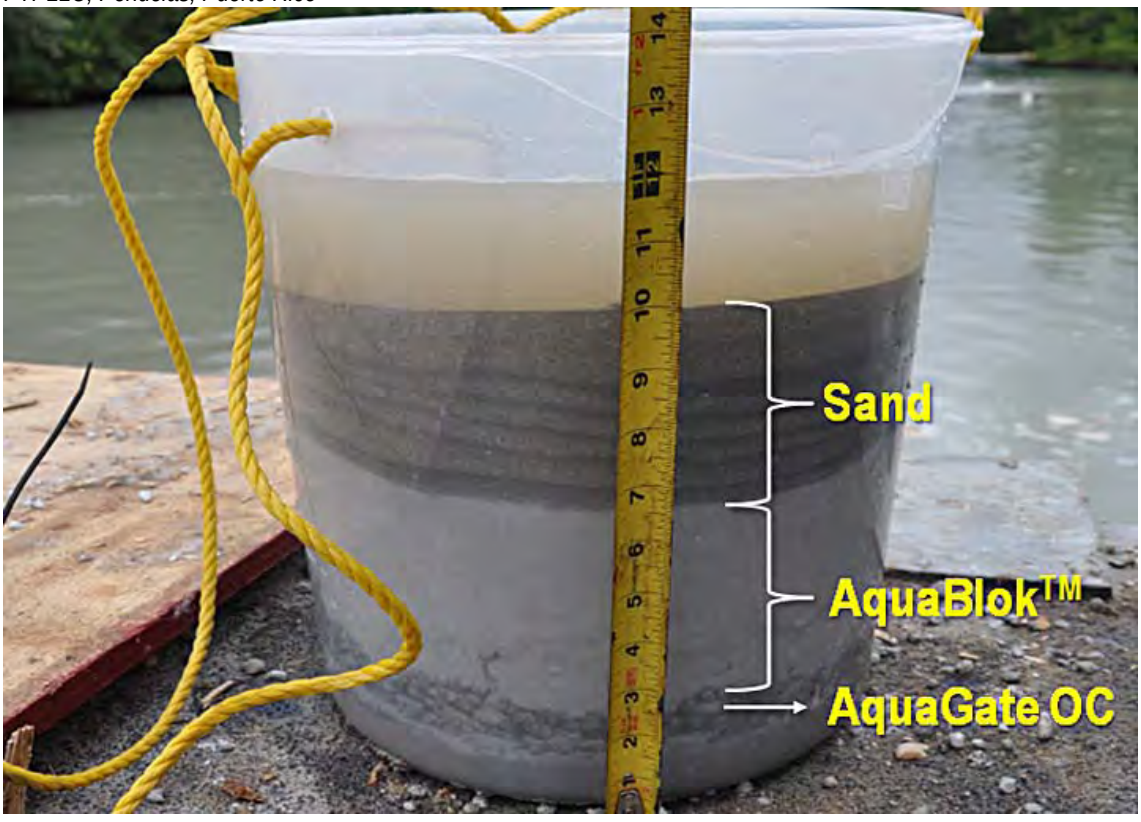
The corner marker buoys and test buckets were installed prior to installation of the AquaBlok cap materials. Test buckets were deployed to monitor material layer thicknesses. Each layer of material was separately monitored. The distribution of cap material by the excavator was difficult to control and a uniform layer across the test cap area could not be achieved. This was confirmed when some of the test buckets were retrieved. The field team had difficulty lifting some of the test buckets because they were full and embedded in the soft sediment. **Figure 5-8** shows the test buckets with the lower layer of organoclay and an upper layer of AquaBlok material overlain by the sand layer. The thickness of the various layers within the test buckets were highly variable since uniform layering by the placement equipment could not be achieved.

5.3.4 Equipment Usage

The equipments used during AquaBlok cap installation included two 24-foot outboard motorboats, a 12-foot outboard Zodiak, a 14-foot canoe, a John Deere 780 Excavator, and canal survey equipment. The GPS was used to place floats at the four corners of the proposed test area to position the barge for cap installation.

FIGURE 5-7
AquaBlok Cap Installation Using Supersack
PTPLLC, Peñuelas, Puerto Rico

FIGURE 5-8
Test bucket Showing Different Layers of AquaBlok Cap
PTPLLC, Peñuelas, Puerto Rico



The barge supported the excavator, AquaBlok supersacks, and stockpile of sand. It was moved into position and the studs were dropped to hold it in position. The outboard boats were used to move staff and materials, and to assist with monitoring and sampling. The Zodiak and canoe were used for observations and staff access.

5.4 Cap 3 – Sand Cap

5.4.1 Cap Description

An approximately 2–foot-thick sand cap was deployed in the planned 25-foot by 25-foot area between transects 4+00 and 6+00 to the south of the AquaBlok cap. The objective of this study was to evaluate the placement techniques and requirements for controlled placement of a 2–foot-thick local quarry sand cap.

5.4.2 Installation Process

The sand cap material was placed in the test cap area in four quarter areas of approximately 6 to 7 feet by 25 feet each. The excavator (with a 1.48 CY bucket) was used to lift and place the sand material over the water in the quarter sections. The amount and distribution of sand was estimated based upon visual evaluation. Similar to the other two caps, the placement of sand in a uniform layer was challenging because of difficulty in controlling the rate of sand placement with the excavator and difficulties associated with visual observation of materials placed underwater. **Figure 5-9** shows the deployment of sand cap material.

5.4.3 Construction Monitoring

The corner markers and test buckets were installed prior to the installation of the sand cap. Test buckets were placed at intervals as conditions allowed across the cap area prior to the placement of sand. The transparent test buckets were periodically lifted and observed to measure sand layer thickness. The locations of buckets were not recorded and the measurement data were primarily used to provide feedback to the installation crew rather than to record cap thicknesses. Also, the test buckets were only 18 inches deep and not suited to monitor a 24-inch-thick sand layer continuously. Thus, the 24-inch cap placement was estimated. The test buckets could not be placed back onto the area from which they were retrieved because of the tidal current and lack of surface water positioning control (boat and wind drift). **Figure 5-10** shows the test bucket used to monitor the sand cap. The appearance of layers in the bucket indicate that the sand particles segregated by sizes as they passed down through the water column, settling in layers of similar sizes.

5.4.4 Equipment Usage

The equipment used during sand cap installation included two 24-foot outboard motorboats, a 12-foot outboard Zodiak, a 14-foot canoe, a John Deere 780 Excavator, and canal survey equipment. The GPS was used to place floats at the four corners of the proposed test area to position the barge for cap installation. The barge supported the excavator and stockpile of sand. It was moved into position and the studs were dropped to hold it in position. The outboard boats were used to move staff and materials, and to assist with monitoring and sampling. The Zodiak and canoe were used for observations and staff access.

FIGURE 5-9
Sand Cap Deployment
PTPLLC, Peñuelas, Puerto Rico

FIGURE 5-10
Sand Cap Test Bucket
PTPLLC, Peñuelas, Puerto Rico

SECTION 6

Field Sampling and Testing

6.1 Surface Water Quality

Four sampling stations (STA-1, 2, 3, and 4) were identified for surface water quality monitoring upstream and downstream of each curtain as shown in Figure 4-1 (presented previously). The purpose of these tests was to check the effectiveness of the turbidity curtains and to determine the level of BMPs required during and after intrusive activities in the canal. Baseline samples were collected on February 23, 2012, and tested for surface water quality parameters to establish background levels for turbidity, total suspended solids (TSS), and PAHs. These parameters were monitored at the four stations to evaluate the water quality prior to, during, and after placement of caps and backfill materials. Also, samples were collected 1 month after completion of field activities and compared to background to evaluate conditions prior to removal of turbidity curtains. The water quality data during monitoring were compared to background levels. All parameters were at levels below background before the curtains were removed.

6.1.1 Turbidity

Turbidity was measured using a Hach 2100 P turbidimeter. The baseline and daily monitoring during pilot scale implementation activities were performed to monitor turbidity levels at all four stations. Turbidity levels were not monitored at stations 3 and 4 on April 3, 2012, because the previous two samples collected showed that turbidity levels were below background. **Figure 6-1** shows the turbidity trend for all the stations over time.

The results for all turbidity measurements are shown in **Table 6-1**. Daily surface water field turbidity logs are provided in **Appendix D**.

6.1.2 TSS

The baseline tests for TSS levels on February 23, 2012, and construction monitoring on March 1 and 2, 2012, were performed at all four stations (STA-1, 2, 3, and 4). At STA-1 and STA-2, TSS levels were monitored 1 month after field activities were concluded to confirm that background conditions were restored prior to the removal of turbidity curtains. **Figure 6-2** shows TSS trends for all four stations. TSS levels were not monitored at STA-3 and STA-4 on April 3, 2012, because the previous sample collected on March 2, 2012, showed that TSS concentrations were below background. The results for all TSS measurements are presented in Table 6-1.

FIGURE 6-1
Turbidity Trends
PTPLLC, Peñuelas, Puerto Rico

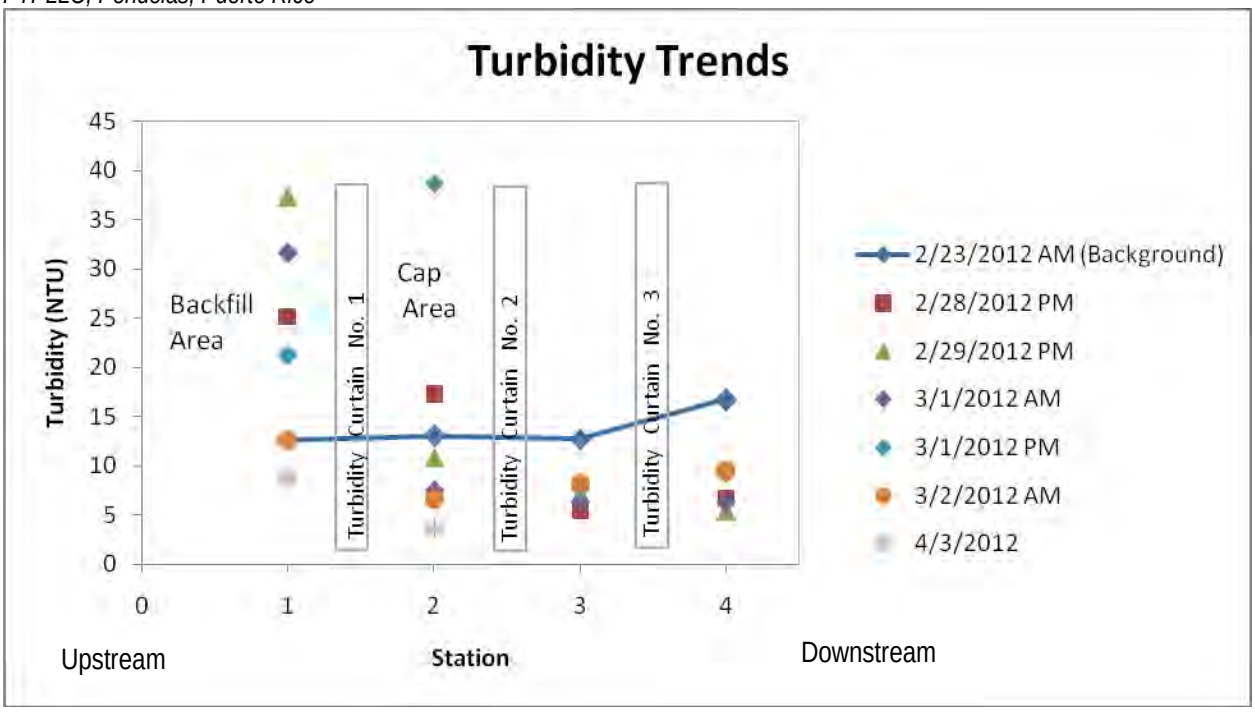


FIGURE 6-2
TSS Trends
PTPLLC, Peñuelas, Puerto Rico

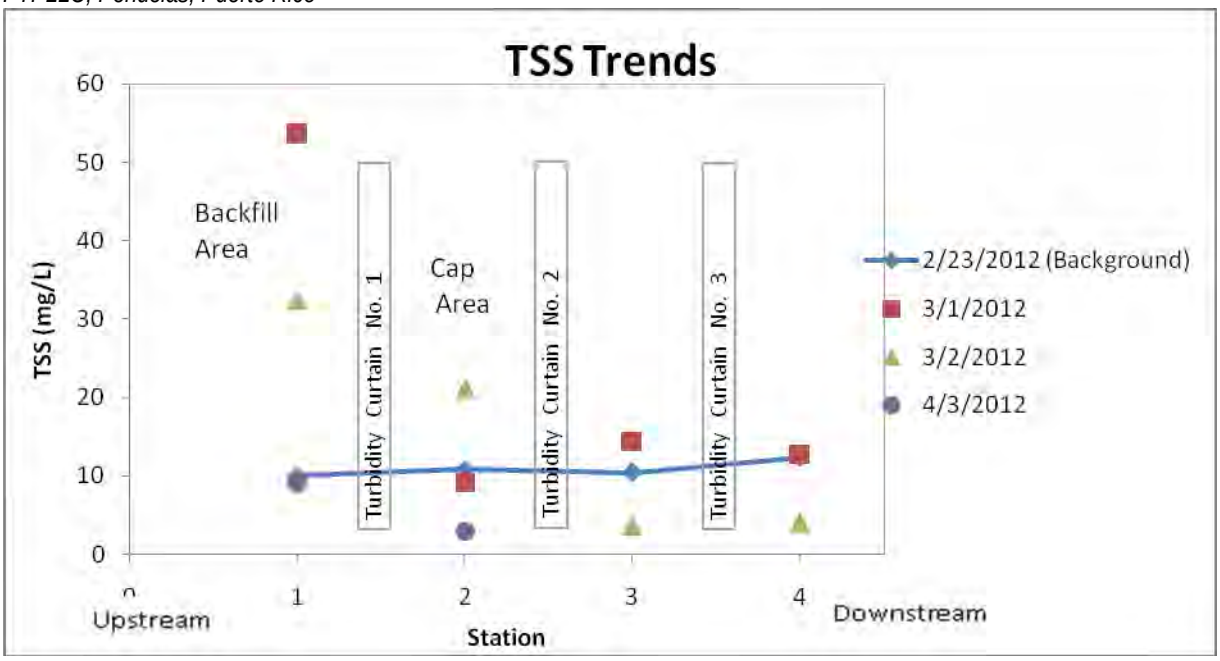


TABLE 6-1
Water Quality Parameter Results
PTPLLC, Peñuelas, Puerto Rico

Date	Time	Station ID	Sample ID	Turbidity (NTU)	TSS (mg/L)		Total PAHs * (µg/L)
2/23/2012	10:20	STA-1	S-1	12.6	10	J	0.702
2/23/2012	10:35	STA-2	S-2	13	10.8	J	0.994
2/23/2012	10:55	STA-3	S-3	12.7	10.4	J	0.983
2/23/2012	11:15	STA-4	S-4	16.7	12.4	=	0.392
2/28/2012	14:15	STA-1	S-1	25.2	NM		NM
2/28/2012	14:20	STA-2	S-2	17.2	NM		NM
2/28/2012	14:22	STA-3	S-3	5.36	NM		NM
2/28/2012	14:27	STA-4	S-4	6.7	NM		NM
2/29/2012	12:42	STA-1	S-1	37.3	NM		NM
2/29/2012	12:45	STA-2	S-2	10.9	NM		NM
2/29/2012	12:54	STA-3	S-3	7.1	NM		NM
2/29/2012	12:58	STA-4	S-4	5.41	NM		NM
3/1/2012	11:40	STA-1	S-1	31.6	NM		NM
3/1/2012	10:50	STA-2	S-2	7.41	NM		NM
3/1/2012	11:02	STA-3	S-3	6.36	NM		NM
3/1/2012	11:20	STA-4	S-4	6.29	NM		NM
3/1/2012	16:46	STA-1	S-1	21.2	53.6	=	1.006
3/1/2012	16:42	STA-2	S-2	38.7	9.2	J	0.741
3/1/2012	16:37	STA-3	S-3	7.58	14.4	=	0.178
3/1/2012	16:35	STA-4	S-4	9.32	12.8	=	0.124
3/2/2012	9:20	STA-1	S-1	12.6	32.4	=	0.903
3/2/2012	9:22	STA-2	S-2	6.55	21.2	=	1.422
3/2/2012	9:25	STA-3	S-3	8.09	3.6	J	0.356
3/2/2012	9:30	STA-4	S-4	9.43	4	J	0.111
4/3/2012	10:10	STA-1	S-1	8.69	9.2	J	0.577
4/3/2012	10:25	STA-2	S-2	3.52	3	U	0.313

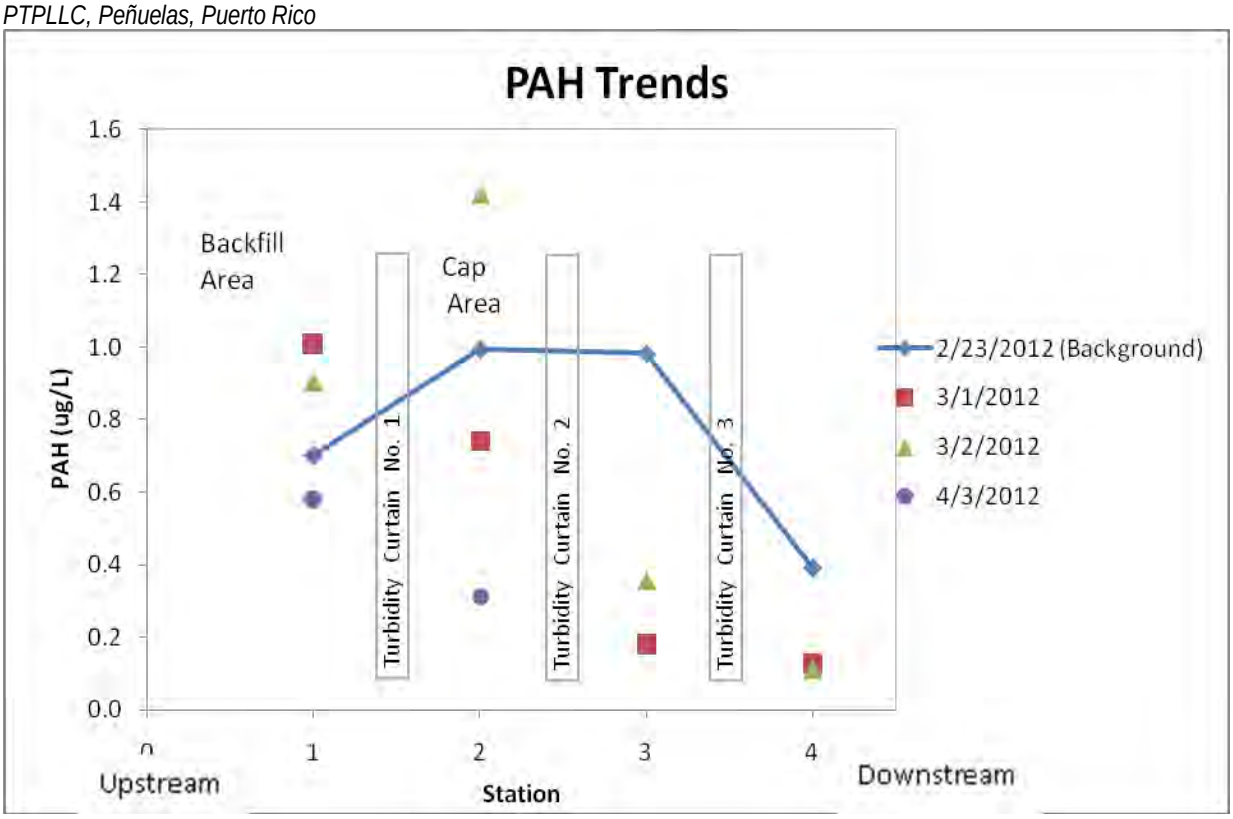
Notes:
Background data were collected on 2/23/2012
mg/L = milligrams per liter
NM = Not measured
NTU = nephelometric tubidity unit
"J" indicates that the analyte concentration is estimated.
µg/L = micrograms per liter
"=" indicates that the chemical was detected.

*Total PAHs represents the sum of all PAHs compounds (1-methylnaphthalene, naphthalene, 2-methylnaphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene) considering where non-detects (NDs) were treated as ½xND

6.1.3 PAHs

The baseline testing for PAH concentrations on February 23, 2012, and construction monitoring on March 1 and 2, 2012, were performed at all four stations (STA-1, 2, 3, and 4). At STA-1 and STA-2, PAH concentrations were monitored 1 month after field activities were concluded to confirm that background conditions were restored prior to the removal of turbidity curtains. **Figure 6-3** shows total PAHs trends for all four stations. The results for all PAH measurements are presented in **Table 6-1**. PAH levels were not monitored at STA-3 and STA-4 on April 3, 2012, because the previous two samples collected showed that PAH concentrations were below background.

FIGURE 6-3
Total PAHs Trend
PTPLLC, Peñuelas, Puerto Rico



6.2 Curtain Effectiveness

Figures 6-1, 6-2, and 6-3 indicate surface water quality in relation to the curtains, work areas, and orientation of the canal. In general, the data showed that the curtains effectively contained the re-suspended solids and prevented migration to unprotected portions of the CWC. Significant observations include the following:

- The backfill and cap areas produced the highest levels of turbidity, TSS, and dissolved PAHs in the water column.
- There was little to no impact above background to surface water downstream of curtain No. 2.
- There were no impacts above background to surface water downstream of curtain No. 3.
- Background PAH concentrations downstream of curtain No. 2 were noticeably higher than concentrations during and after field activities.

SECTION 7

Laboratory Procedures

7.1 TSS

TSS was analyzed using method SM 2540D. The total suspended solids are those amounts of residue retained by laboratory filter paper for a specific volume of liquid sample. A well-mixed sample is filtered through a weighted standard glass-fiber filter and the residue retained on the filter is dried to a constant weight at a temperature of 103 to 105 degrees Celsius (°C). The increase in the weight of the filter represents the TSS for the volume of liquid. The results are presented in milligrams per liter (mg/L).

7.2 PAHs

PAHs were analyzed using method SW846 Method 8270-SIM. This method is used to quantitate a subset of the larger group of SVOCs. PAH compounds are fused aromatic rings that are lipophilic, meaning they have better solubility in an oil matrix than in water. The PAH list is part of the larger group of basic/neutral and acidic organic compounds that are extracted by use of methylene chloride without target derivatization occurring in that process. Sample extracts are introduced to the mass spectrum detector via a gas chromatograph using a narrow-bore fused silica capillary column. Use of the gas chromatograph/mass spectrometer (GC/MS) configured in the SIM mode makes the detection of parts per billion levels of PAHs achievable. Operation of a GC/MS instrument configured in SIM mode allows for detection of specific analytes with increased sensitivity relative to that found in a full-scan mode. The GC/MS SIM will dwell on the mass of interest with increased scan rate and dwell. The results are presented in micrograms per liter (µg/L). The list of PAHs for which samples were analyzed included 1-methylnaphthalene, naphthalene, 2-methylnaphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene.

SECTION 8

Conclusions and Lessons Learned

8.1 Marine Surveys

The underwater topography in the CWC was little changed from the surveys conducted in 2009 to those conducted in 2012 before cap placement. In the area of the pilot test caps, the elevations in 2009 were 0.5 to 1 foot lower (elevation -5) than the same area in 2012 (elevation -4.0 to -4.5).

An erosion area was observed on the 2012 side-scan sonar image and bathymetry map just southwest of Cap 3 (sand cap); this feature did not appear in the 2009 data, indicating that it occurred subsequent to the Phase 1 studies. The erosion depths approached 6.5 to 7 feet below msl, up to 2.5 feet below the surrounding canal bed. This feature is attributed to propeller scour from boat operations. No other changes in bottom conditions or contours were noted, indicating relatively stable physical conditions in the canal.

Observations of the canal bottom in the pre-cap and post-cap surveys (Figures 2-1 and 2-2) indicated some expected change in topography due to cap placement, but also a few inconsistencies:

- The placed cap locations were consistently shifted approximately 20 feet to the northeast from the planned locations.
- The change in bathymetry did not account for the thickness of material placed within the cap area.
- Bathymetry survey (Figure 2-2) and bucket test results (Figures 5-5, 5-7, and 5-9) indicated that required uniform thicknesses could not be achieved. In the case of the sand cap, the bathymetry survey showed a range of elevation increase from 0.25 to 0.75 feet compared to the planned 2-foot thickness of the sand cap; this could be attributed to sand cap material subsidence into soft canal sediments.

Conclusions from these observations include:

- The canal bottom is susceptible to scour from boat propellers to depths of at least 7 feet below msl.
- Placement accuracy of material from a barge will need to be improved by:
    - A more robust positioning system to fix barge and equipment locations within a horizontal tolerance of 1 foot or less.
    - Preventing drift of the barge during material placement with spuds or multiple anchors.
    - Placing material during slack tide to prevent material drift in the water column by currents.

- Placement thickness measurements of material will need to be improved by:
  - Taller buckets, and/or incremental readings (between each lift) at locations that can be accurately reacquired.
  - Settlement gauges to measure consolidation settlement and layer thickness.
  - More accurate horizontal surveys.
- Increased accuracy of measurements may require divers or improved remote sensing instruments.

8.2 Gas Ebullition, Seepage Flux and Surface Water/Groundwater Interaction

Gas ebullition testing was performed at the laboratory during bench scale tests performed in Phase 1 studies with no success. Therefore, attempts were made to capture any gas generation from sediments onsite during Phase 2 field work. Seepage flux and surface water/groundwater interaction studies were conducted in the field during Phase 1 investigations, but duration of the test was short. Therefore, both sediment water flux and water level activities were performed for a longer period in Phase 2. Conclusions from these observations are discussed below.

8.2.1 Gas Ebullition

Laboratory tests on sediment samples showed no gas generation in Phase 1 studies. The plan was to determine the effect of cap placement that could generate conditions which could potentially be conducive for gas generation; however, no conclusive results could be obtained during laboratory experiments. Therefore, an attempt was made during the Phase 2 pilot studies to assess gas ebullition in the field. A U-tube manometer filled with site water was used to measure the potential gas pressure. Due to high density of site water compared to the gases that could be potentially present in the sediments, however, no valid readings could be obtained. Therefore, no conclusive results could be obtained.

The gas ebullition test assembly used at the site was not effective and requires redesign to address gas pressure changes.

8.2.2 Seepage Flux

The Phase 1 seepage meter flux results were considered preliminary because the meters were deployed for relatively short periods of time and measured small changes in water volume. However, it was noted that low flux rates at the site could also be due to fine-grained sediments, low gradients, or both.

Additional meters were deployed during Phase 2 field activities for longer periods. Only one meter (HB2) was successful in obtaining readings for longer durations. The flux calculations for seepage meter HB2 showed an increase and then a decrease in flux, which can be attributed to the tidal action. The other two attempts were abandoned mid-study because one meter was pushed up by the barge and insufficient time was left

to reinstall the meter, and because the other meter was found floating (assumed to be the result of natural buoyancy).

Based on this study, it was noted that half-barrel seepage meters should be constructed out of metal drums, installed in shallow water with good visibility, and preferably inspected by a diver to make sure the meters are installed correctly. An alternative to divers is a viewing tube made from 6- inch PVC pipe, Plexiglas, and silicone caulk.

Also, seepage meters should not be installed near significant work activity because waves and turbulence would affect water rising in the tubing (creating a pumping action) and because half-barrels can potentially be overturned by strong propeller wash.

8.2.3 Groundwater and Surface Water Levels

The substance of the observations in Section 3.3 can be summarized as follows:

- The groundwater levels in the vicinity of the northern portion of the CWC (F15) is very near the surface water level in the canal; thus, the gradient between surface water and groundwater is very small, varying from a small positive to a small negative flux.
- The groundwater levels in the northern portion of the CWC (F15) are affected by extraction pumping in the southwest area of the landfill (just north of the canal), and pumping is likely to continue indefinitely.
- Groundwater levels near the lower part of the canal (D22) were observed to be about 4 feet above the surface water level in the canal, indicating little or no influence from the groundwater extraction to the north, and a net flux from groundwater into the canal.

Conclusions from these observations include:

- The flux between groundwater and surface water in the northern portion of the canal is small to none, and:
  - Will have little to no effect on contaminant flux into surface water (very low advection due to groundwater flux)
  - Should not affect the selection of a remedy that may restrict pore water flux through the sediment (e.g., impervious cap).
  - Extraction pumping is planned for the long term, but if future conditions end this activity, groundwater levels would return to pre-extraction levels, potentially creating some contaminant flux (2 to 3 feet) toward the canal.
- The flux in the southern portion of the canal is likely to be on the order of several feet of head from groundwater to surface water, and:
  - May impel some contaminant flux into surface water, but contaminant concentrations are much lower in the southern portion of the canal and contaminant flux would be low.

- Selection of a remedy that may restrict pore water flux through the sediment will need to consider a hydraulic head of several feet upward toward an impervious cap.

8.3 Environmental Considerations

Removal of mangroves for this pilot study was strictly limited by the USACE Nationwide Permit for this study; however, it is expected that additional mangrove removal will be provided during remediation due to the nature of the construction (i.e., reducing environmental risk of exposure to contaminants). Regardless, preservation of mangroves by avoiding damage or removal, combined with enhancement of mangrove habitat and propagation of new mangroves, should be considered significant components of the final remedy.

Manatee encounters in the canal were common during the initial portions of the pilot study, but disturbance was minimized by BMPs such as providing a continuous watch for manatee presence, and stopping work and boats when manatees were present. A net placed across the canal downstream of the work area effectively eliminated further encounters during work activities, and should be considered an important requisite for final remedy implementation. The manatee net could not be located after site activities and could not be inspected for condition.

The primary turbidity controls consisted of three curtains located downstream of related activities. These were considered effective at containing re-suspended solids. Figure 6-1 showed a graph of the turbidity versus time at each sample location. After being in the canal for 3 months, the curtains were removed and decontaminated. Considerable biofouling and other marine growth damage were noted on the curtains, adding significantly to their weight and increasing the effort required to clean them. From these results and other observations, the following can be concluded:

- The curtains were effective in containing most of the turbidity within the work areas (as measured by nephelometric turbidity units [NTUs] and TSS) during activities in the canal.
- Turbidity levels decreased in the downstream direction (Stations 1, 2, 3 and 4), indicating that multiple curtains provided additional containment.
- Turbidity decreased with time after canal work ceased, indicating that the solids re-suspended by work activities did resettle.
- Curtains deployed during the remedy should be considered expendable, and may have to be replaced after work periods longer than 6 months.

8.4 Constructability of Backfill and Caps

Observations made during the pilot backfilling and cap construction operations were logged during field work and thoroughly developed later to provide detailed documentation of successes and challenges. The following discussion is provided as constructive support to the remedy development and selection process.

8.4.1 Backfill

Of the proposed backfill placement techniques, Method 2B consisting of thin lifts placed without compaction was least likely to cause sediment displacement such as mud waves. However, Method 2B was not performed until after Method 2A, which caused significant displacement of the sediment. Also, the efficacy of the settlement gauge was more aligned with Method 2B, and not adaptable to Method 2A as performed initially. As a result, the settlement gauge performance was not tested.

Observations of the backfill process are summarized as follows:

- Method 2A (1 foot lifts compacted) exceeded the strength of the sediment and created a mud wave. Most of the disturbance was created by the compaction.
- Method 2B (loose placement of the caliche fill after initial disturbance) was more effective in minimizing the development of the mud wave. Spreading backfill in thin lifts (e.g., 6 inches to 1 foot) and not compacting the material reduced mud wave displacement significantly.
- Although no movement or further displacement was observed after backfilling operations were completed, minor movements such as those due to consolidation settlement, were not measured and were likely to have occurred.

The following conclusions are made from the backfill observations:

- The bulldozer operation, specifically the track-compaction, added significant weight in addition to the fill lifts placed, and thus created a large load sufficient to create the mud waves during the tracking and compacting.
- Spreading in thin lifts with the bulldozer, or other low pressure placement methods would not likely have caused mud waves.
- The settlement gauge has been shown to work under low pressure placement methods such as Method 2B, and would be expected to work at this site under those conditions.
- Equipment required for low pressure placement would include a long-reach backhoe or clamshell with controlled material dispersion, or a hopper/spreader device, and real-time positioning instruments.

8.4.2 CETCO RCM and Sand Cap

The installation of the RCM in this pilot test was devised to accommodate the limited scope of the panels placed, and the lack of specialized equipment and skills available in the region. Both the RCM and sand placement processes would have been considerably different if a large portion of the canal were being capped, as discussed further in the conclusions presented below.

The following bullets summarize the observations made during the placement of the RCM and sand:

- The two RCM sections were sewn together to simplify the installation; installation of one square panel (of the two sections sewn together) was considered easier than

installing two individual panels. The placement of an overlap between the two individual sections underwater was not attempted.

- The chains in pockets of the RCM material were added to weigh the panel down to submerge it. However, since chains were not directly hemmed to RCM, but allowed to slide through the pocket, the heavy RCM slipped and bunched toward the middle of the chain, folding and reducing the deployed width.
- The weight of the RCM and chains on the barge was too great for the outboard boats to pull it into the water. This required the excavator and a harness system to suspend the mat over the water, making the RCM placement more difficult to control.
- Placement of the sand was performed by spreading from the excavator bucket; limited excavator bucket and arm control and limited underwater visibility made it difficult to distribute the sand evenly in layers.
- The unevenness of sand placement caused displacement of the underlying soft sediments where the sand was placed in large clumps over a small space and period of time. This caused the mat to be pushed down into the soft sediments, creating "pockets" of material that further shifted the position of the RCM from the planned square shape.
- Test buckets did provide some feedback in the field regarding sand placement progress, but the position, number, and thicknesses of material in the buckets were not recorded for final sand thickness distribution.

The following conclusions are made from the RCM/sand cap deployment observations:

- Deployment of the RCM at full scale is typically made from the rolls as they are shipped. The center of the roll is supported by a spreader bar (such as a steel rebar or pipe). The lead end of the RCM would then be attached to another steel pipe lifted with a sling, and deployed by unrolling. The roll can be submerged initially to absorb water, which will weigh it down to facilitate placement on the bottom by slowly unrolling. This obviates the need for chains to submerge the mat.
- Alternately, a PVC frame can be used for attaching the RCM to maintain its rectangular dimensions while being placed.
- Sewing together of adjacent panels would not be practicable or necessary during full-scale implementation, as long as the overlap could be provided during placement, and confirmed after placement.
- Two separate barges would improve the operation and provide a support platform for equipment handling each end of the mat being deployed (i.e., the roll end and the lead end).
- A low energy dispersion method using fluidized material would greatly improve the control and uniformity of sand placement in layers. Equipment would consist of hopper-fed sand spreaders attached to the barge; the spreaders would be operated as the barge slowly moved forward. Alternately, material could be sluiced off the end of the barge with a hose. For either method, the placement rate is typically calibrated prior to cap placement.

- Both the mat and sand placements would have been better controlled and recorded with a more formal positioning system (e.g., differential GPS with stakes, markers). Test buckets should be deployed in surveyed locations to measure the final placed thickness; this method could be combined with graduated stakes and divers or other measurement systems. Bathymetric and side-scan surveys are not adequate confirmation of sand placement thicknesses because their vertical resolutions are inadequate for measurements on the scale necessary to confirm adequate cap construction thickness of within 2 to 3 inches (10 percent of a 2–foot-thick cap).
- Pilot-scale procedures and full-scale implementation would both benefit from diver observations, to confirm positions, thicknesses, and final cap status.

8.4.3 AquaBlok-OrganoClay, AquaBlok and Sand Cap

The installation of the AquaBlok materials in this pilot test was devised to accommodate the lack of any specialized equipment and skills available in the region. Both the AquaBlok and sand placement processes would have been considerably different if a large portion of the canal were being capped, as discussed in the conclusions provided below.

The following bullets summarize the observations made during the placement of the AquaBlok and sand:

- Placement of the AquaBlok material was performed by opening the bottom of the supersack and suspending it over the water with the excavator arm, allowing the material to fall into the water. Limited excavator arm control and limited underwater visibility made it difficult to distribute the materials evenly in layers.
- Placement of the sand was performed by spreading from the excavator bucket; limited excavator bucket and arm control and limited underwater visibility made it difficult to distribute the sand evenly in layers.
- The unevenness of material placement caused displacement of the underlying soft sediments where the material was placed in large clumps over a small space and period of time. This caused the material to sink down into the soft sediments and likely resulted in an uneven thickness of material.
- Test buckets did provide some feedback in the field regarding material placement progress, but the position, number, and thicknesses of material in the buckets were not recorded for final layer thickness distribution.

The following conclusions are made from the AquaBlok/sand cap deployment observations:

- The excavator did succeed in deploying the AquaBlok cap materials directly from the supplier's supersacks; however, placement of a uniform lower 1-inch-thick reactive organoclay layer and upper 4-inch-thick AquaBlok layer was unattainable due primarily to excavator arm control limitations.
- A low-energy application method using evenly distributed material would improve the control and uniformity of AquaBlok and sand placement in layers. Equipment would consist of mechanical sand-type spreaders attached to a barge; the spreader is

operated as the barge slowly moves forward. The placement rate is typically calibrated prior to cap placement, based on volume coming from a feed hopper and the distance traveled. Hydraulic placement methods would be problematic since the AquaBlok material reacts with water and changes consistency from an aggregate to a soft goo.

- Both the AquaBlok and sand placements would have been better controlled and recorded with a more formal positioning system (e.g., differential GPS with stakes, markers). Test buckets should be deployed in surveyed locations to measure the final placed thickness; this method could be combined with graduated stakes and divers or other measurement systems. Bathymetric and side-scan surveys are not adequate confirmation of material placement thicknesses.
- Pilot study-scale procedures and full-scale implementation would both benefit from diver observations, to confirm positions, thicknesses, and final cap status.

8.4.4 Sand Cap

The installation of the sand cap in this pilot test was devised to accommodate the lack of any specialized equipment and skills available in the region. The sand placement processes would have been considerably different if a large portion of the canal were being capped, as discussed in the conclusions presented below.

The following bullets summarize the observations made during the placement of the sand:

- Placement of the sand was performed by spreading from the excavator bucket; limited excavator bucket and arm control and limited underwater visibility made it difficult to distribute the sand evenly in layers.
- The unevenness of material placement likely caused displacement of the underlying soft sediments where the material was placed in large clumps over a small space and period of time, as with other test caps.
- Test buckets did provide some feedback in the field regarding material placement progress, but the position, number, and thicknesses of material in the buckets were not recorded for final layer thickness distribution.
- The 18–inch-tall buckets were not deep enough to record a 24-inch sand layer placement in one increment. Returning test buckets to the same position after interim readings during sand placement was difficult due to tidal currents.

The following conclusions are made from the sand cap deployment observations:

- The placement of sand in even layers was difficult due primarily to excavator arm control limitations. The excavator operator was not able to adequately control the excavator arm.
- A low energy dispersion method using fluidized material would greatly improve the control and uniformity of sand placement in layers. Equipment would consist of a "spreader" or other dispersion method attached to a barge; the spreader is operated as the barge slowly moves forward. The placement rate is typically calibrated prior to cap placement.

- Sand placement would have been better controlled and recorded with a more formal positioning system (e.g., differential GPS with stakes, markers). Test buckets should be deployed in surveyed locations to measure the final placed thickness; this method could be combined with graduated stakes and divers or other measurement systems. Bathymetric and side-scan surveys are not adequate confirmation of material placement thicknesses.
- Pilot-scale procedures and full-scale implementation would both benefit from diver observations, to confirm positions, thicknesses, and final cap status.

It should be noted that throughout the planning and execution of these treatability studies, considerable progress has been made in the U.S. and Europe in equipment and procedures to successfully install cap materials. The absence of these specialized procedures, expertise, and equipment in Puerto Rico would require at least some of the equipment and expertise to be imported to install these materials. Collaboration with capping experts and equipment suppliers from the U.S. would significantly improve the likelihood of a successful cap installation.

8.4.5 Summary

The field tests described in this report confirmed the challenges that will be faced when implementing full-scale remedies to contain the contaminated sediments at the site. Although the capping and backfilling techniques utilized for Phase 2 have been demonstrated at other sites, specific equipment and expertise will be required to overcome the site-specific issues.

Most of the challenges involve vertical and horizontal controls and measurement during placement of cap materials in subaqueous conditions. Based on current CH2M HILL experience, additional technologies not available at this site will be required to improve (and refine) the methods tested to achieve consistent and verifiable results. Examples of technology improvements include:

- Control and confirmation of subaqueous mat deployment using divers.
- Control of sand and aggregate cap material placement to provide a uniform and accurate layer thickness.
- Measurement techniques of placed cap materials which include coring, settlement plates, diver inspection, and surveys.

Available technologies will be discussed and evaluated in more detail during the CMS, especially when selecting and describing the recommended technologies. These technology evaluations will be based on experience at similar sites where successful implementation has been completed by experienced construction contractors with specialized equipment.

The design of the selected remedy will include input and proposals from qualified contractors to optimize the capping/backfilling processes.

SECTION 9

References

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Appendix A

U.S. Army Corps of Engineers (USACE) Nationwide Permit

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
ANTILLES OFFICE
400 FERNANDEZ JUNCOS AVENUE
SAN JUAN, PUERTO RICO 00901-3299

REPLY TO
ATTENTION OF

August 28, 2009

Antilles Regulatory Section
SAJ-2009-2499 (NW-EWG)

Mr. Joel Rivera Velez
Operations Manager
CH2M Hill
Hwy. 127 Km. 17.3
Peñuelas, Puerto Rico 00624

Dear Mr. Rivera Velez:

Reference is made to the Department of the Army (DA) permit application, submitted on July 2, 2009, through Joint Permit Application (JPA) number 986 on behalf of Union Carbide Caribe. The project entails a treatability pilot study to evaluate different technologies for the cleanup of contaminated sediments located within the Cooling Water Canal identified as SWMU Number 5 at the Union Carbide Caribe (UCC), LLC facility. The proposed work will involve the backfill of 0.03 acres of the canal, the excavation of 0.01 acres, dewatering of canal sediments, and deployment of pilot-scale subaqueous cap systems to cover the impacted sediments. This study will be performed in accordance with corrective action requirements under the UCCLLC Resource Conservation and Recovery Act (RCRA) Hazardous Waste Permit. The proposed project is located at the UCCLLC cooling water canal, PR-127, km. 17.3, Tallaboa Poniente Ward, Peñuelas, Puerto Rico. Lat. 17º 59.835'N Lon. 66º 44.827'W Please refer to number SAJ-2009-2499 (NW-EWG) in future correspondence regarding this case.

This letter verifies that the above described activities are authorized by Nationwide Permit (NWP) Number 38 for Cleanup of Hazardous and Toxic Waste. In addition, project specific conditions have been enclosed. This verification is valid until **August 28, 2011**. This verification is based on the information provided as part of the above referenced permit application.

Please visit the U.S. Army Corps of Engineers' Jacksonville District's Regulatory web site at http://www.saj.usace.army.mil/regulatory/permitting/nwp/nwp.htm to access web links to view the Final Nationwide Permits, Federal Register Vol. 72, dated March 12, 2007, the Corrections to the Final Nationwide Permits, Federal Register 72, May 8, 2007, and the List of Regional Conditions. These files contain the description of the Nationwide Permit authorization, the Nationwide Permit general conditions, and the regional conditions, which apply specifically to this verification. A copy of a portion of the Final Nationwide Permits, Federal Register Vol. 72, dated March 12, 2007, has been enclosed, specifically pages 11180 through 11198.

Additionally, enclosed is a list of the six General Conditions, which apply to all DA authorizations. You must comply with all of the special and general conditions and any project specific condition of this authorization or you may be subject to enforcement action. In the event you have not completed construction of your project within the specified time limit, a separate application or re-verification may be required.

The following special conditions are included with this verification:

1. This verification does not authorize work or the discharge of dredged or fill material in forested wetlands, tidal wetlands, or areas with submerged aquatic vegetation.

2. The work described above shall be completed in accordance with the information and drawings submitted as part of the above referenced permit application (JPA # 986).

3. Best management practices for erosion and sedimentation control shall be implemented and maintained at all times during the while work in waters of the United States is being conducted. Silt curtains shall be used around work areas to minimize sediment transport downstream from the proposed project site. Erosion and sedimentation control devices shall be left and maintained in place until all work is completed. All measures shall prevent siltation and turbid discharges into aquatic habitats.

4. Within 60 days of completion of the work authorized, the attached "Self-Certification Statement of Compliance" must be completed and submitted to the U.S. Army Corps of Engineers. Mail the completed form to the letterhead address.

5. The Permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structures or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the Permittee will be required, upon due notice from the U.S. Army Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

6. No structure or work shall adversely affect or disturb properties listed in the National Register of Historic Places or those eligible for inclusion in the National Register. Prior to the start of work, the Permittee or other party on the Permittee's behalf, shall conduct a search in the National Register Information System (NRIS). Information can be found at; http://www.cr.nps.gov/nr/research/nris.htm.

7. If unexpected cultural resources are encountered at any time within the project area that was not the subject of a previous cultural resource assessment survey, work should cease in the immediate vicinity of such discoveries. The permittee, or other party, should notify the SHPO immediately, as well as the appropriate Army Corps of

Engineers office. After such notifications, project activities should not resume without verbal and/or written authorization from the SHPO.

This letter of authorization does not obviate the necessity to obtain any other Federal, State, or local permits, which may be required.

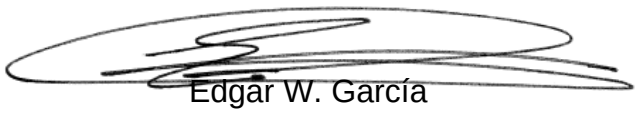
This letter does not give absolute Federal authority to perform the work as specified on your application. The proposed work may be subject to local building restrictions mandated by the National Flood Insurance Program. You should contact your local office that issues building permits to determine if your site is located in a flood-prone area, and if you must comply with the local building requirements mandated by the National Flood Insurance Program.

If you are unable to access the internet or require a hardcopy of any of the conditions, limitations, or expiration date for the above referenced NWP, please contact Mr. Edgar W. García by telephone at 787-729-6905 ext. 3059.

This letter also contains a preliminary Jurisdictional Determination (JD), which only indicates that there may be waters of the United States on the project areas, but does not make an official determination of jurisdictional waters. Enclosed you will find the preliminary JD form and the corresponding Notification of Appeal Process fact sheet and Request for Appeal (RFA) form. In accordance with U.S. Army Corps of Engineers Regulatory Guidance Letter No. 08-02, please be advised that you have the option to request and receive an approved JD for the project areas associated with the above referenced permit application. If you agree to receive DA authorization for your project based on a preliminary JD, please sign and return the enclosed preliminary JD form. Unless you notify us otherwise, your signature on the enclosed preliminary JD form will indicate that you are declining your option to obtain an approved JD for the project site.

Thank you for your cooperation with our permit program. The Corps Jacksonville District Regulatory Division is committed to improving service to our customers. We strive to perform our duty in a friendly and timely manner while working to preserve our environment. We invite you to take a few minutes to visit the following link and complete our automated Customer Service Survey: http://regulatory.usacesurvey.com/. Your input is appreciated – favorable or otherwise.

Sincerely,



Edgar W. García
Project Manager

Enclosures

Garcia/CESAJ-RD-NA/EWG

GENERAL CONDITIONS
33 CFR PART 320-330
PUBLISHED FR DATED 13 NOVEMBER 1986

1. The time limit for completing the work authorized ends on **August 28, 2011**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort of if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow a representative from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

REQUEST PERMIT TRANSFER: PERMIT NUMBER: SAJ-2009-02499 (NW-EWG)

When the structures or work verified by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. Although the construction period for works authorized by Department of the Army permits are finite, the permit itself, with its limitations, does not expire. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, the present permittee and the transferee should sign and date below. This document must then be provided to the Chief, Antilles Regulatory Section, U.S. Army Corps of Engineers, 400 Fernández Juncos Avenue, San Juan, Puerto Rico 00901-3299.

_____ _____
(PRESENT PERMITTEE SIGNATURE) (DATE)

_____ _____
(TRANSFEREE SIGNATURE) (DATE)

_____ _____
(Name - Printed) Lot/Block of site

_____
(Street Address)

_____
(City, State, and Zip Code)

Flood Plain Information:

This Department of the Army permit does not give absolute authority to perform the work as specified on your application. The proposed work may be subject to local building restrictions. You should contact the local office in your area that issues building permits to determine if your site is located in a flood-prone or floodway area, and if you must comply with the local building requirements mandated by the National Flood Insurance Program.

SELF-CERTIFICATION STATEMENT OF COMPLIANCE
Permit Number: SAJ-2008-2499 (NW-EWG)

Permittee's Name & Address (please print or type):
_____
_____
_____

Telephone Number: _____

Location of the Work:
_____
_____

Date Work Started: _____ Date Work Completed: _____

Description of the Work (e.g. bank stabilization, residential or commercial filling, docks, dredging, etc.):
_____
_____
_____
_____

Acreage or Square Feet of Impacts to Waters of the United States:
_____

Describe Mitigation completed (if applicable):
_____
_____
_____

Describe any Deviations from Permit (attach drawing(s) depicting the deviations):
_____
_____
_____
_____

****

I certify that all work, and mitigation (if applicable) was done in accordance with the limitations and conditions as described in the permit. Any deviations as described above are depicted on the attached drawing(s).

_____
Signature of Permittee

_____
Date

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Mr. Timothy A. King, Union Carbide Caribe	File Number: SAJ-2009-02499	Date: August 28, 2009

Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
	APPROVED JURISDICTIONAL DETERMINATION	D
X	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- *ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.*
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- *ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.*
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- *ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.*
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: **Edgar W. García** **787-729-6905/6944 ext. 3059**	If you only have questions regarding the appeal process you may also contact: **for process:** **Stuart Santos 904-232-2018**

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_____ Signature of appellant or agent.	Date:	Telephone number:

Legend

- UCCLLC Property Boundary
- Facility Boundary

Source:
1. Aerial: USDA, 2007

North

0 500 1,000 2,000
Feet

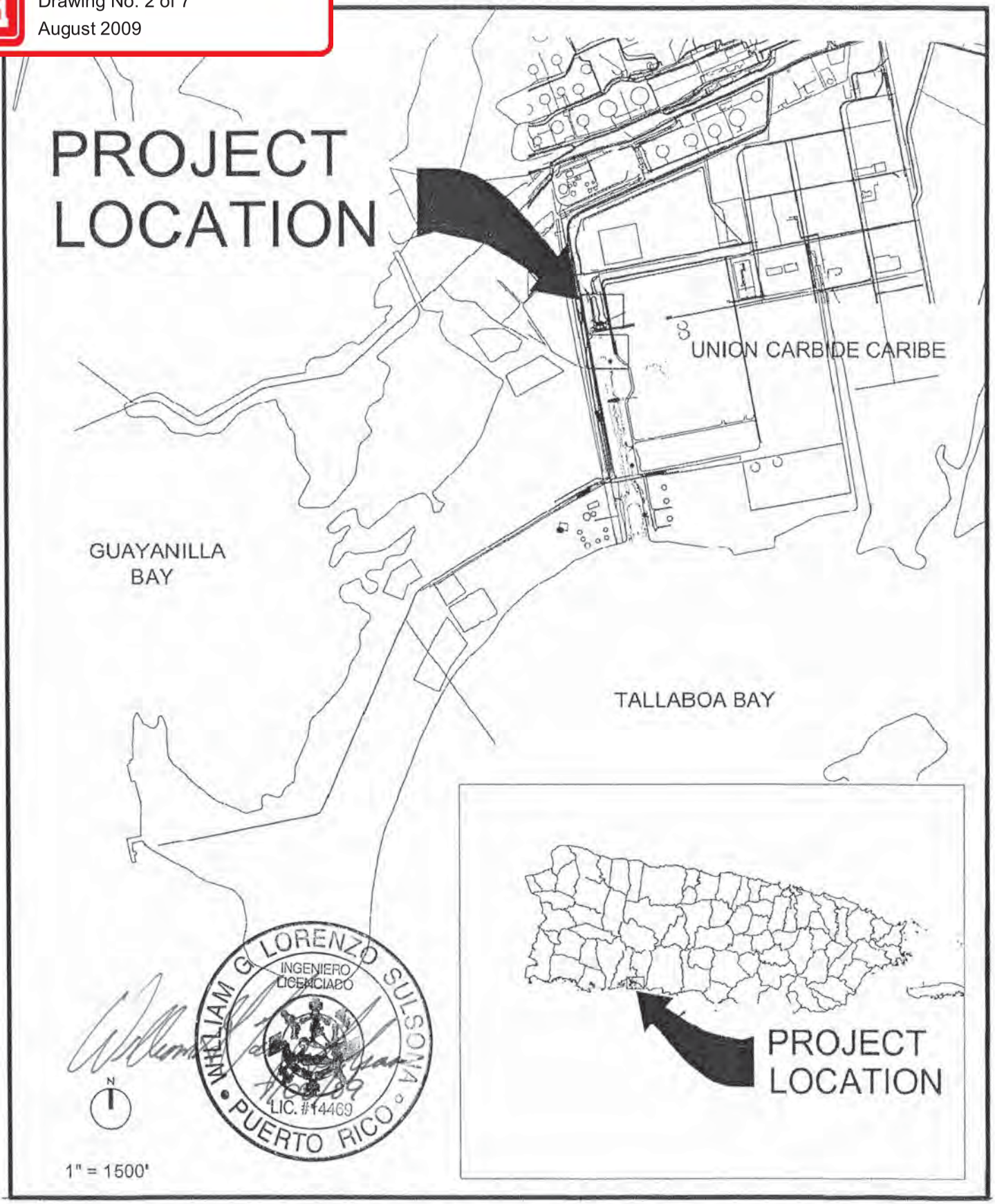
FIGURE 1
Facility Location Map
SWMU No. 5 Treatability Pilot Study
UCCLLC, Puerto Rico

CH2MHILL

ES022009001TPA 382703.01.RW

Permit No. SAJ-2009-2499
Drawing No. 2 of 7
August 2009

PROJECT LOCATION



WILLIAM G. LORENZO SULSONA
INGENIERO LICENCIADO
LIC. #14469
PUERTO RICO

PLOTTED:	–
TIME:	–
PLOT SCALE:	–
DESIGNED:	DL
DRAWN:	BB
CHECKED:	RG
APPROVED:	WL
DATE:	5-2009

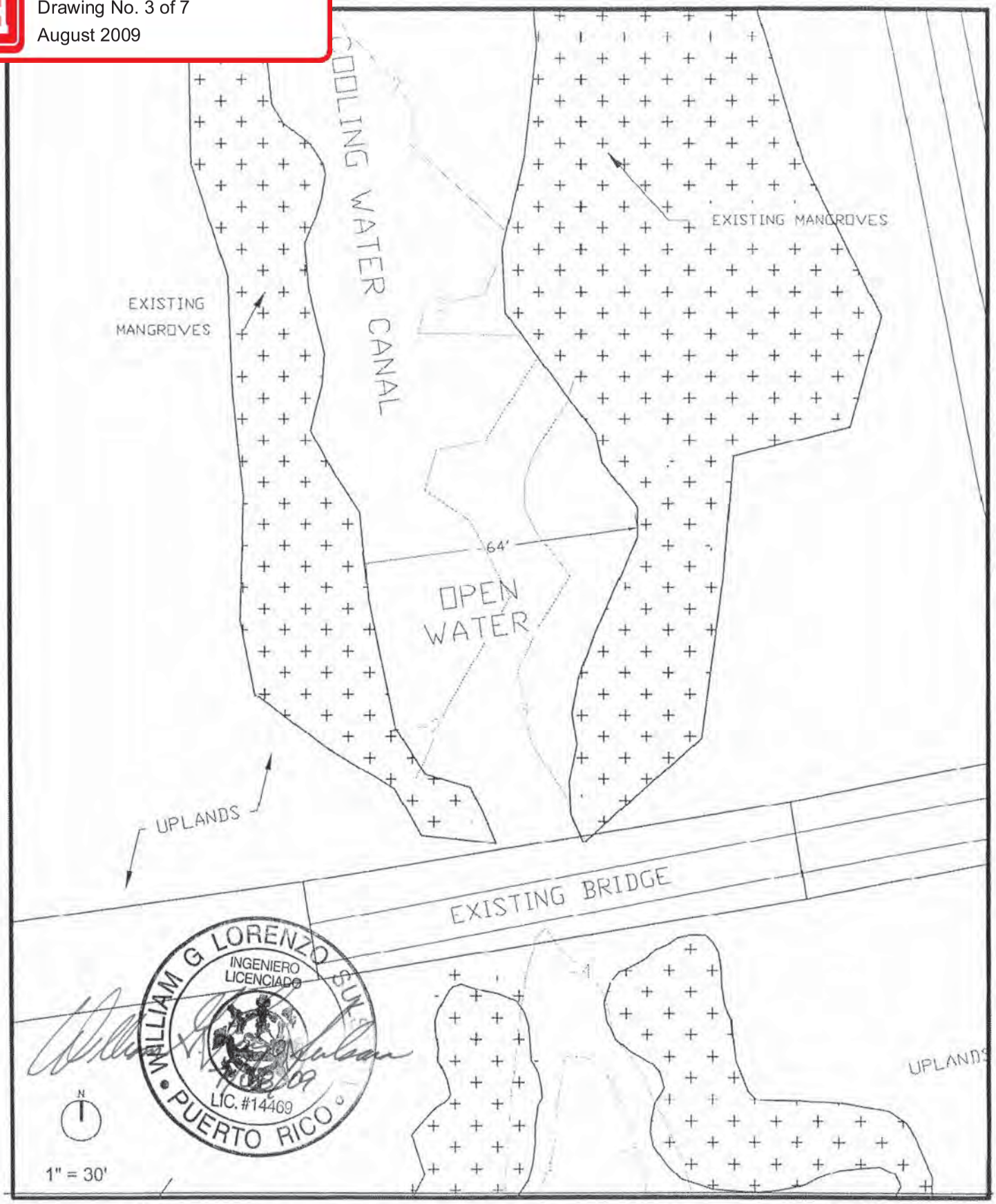
COOLING WATER CANAL (SWMU No 5) TREATABILITY PILOT STUDY
UNION CARBIDE CARIBE LLC
PEÑUELAS, PUERTO RICO

LOCATION

CH2MHILL
4350 W Cypress
Suite # 600
Tampa, Florida
33607

JOB No. 387333
CAD FILE CAD FILE
SHEET NUMBER A1
SHEET OF

Permit No. SAJ-2009-2499
Drawing No. 3 of 7
August 2009



WILLIAM G LORENZO SUAREZ
INGENIERO LICENCIADO
LIC. #14469
PUERTO RICO

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TIME:	–
PLOT SCALE:	–
DESIGNED:	DL
DRAWN:	RR
CHECKED:	RG
APPROVED:	WL
DATE:	5-2009

COOLING WATER CANAL (SWMU No 5) TREATABILITY PILOT STUDY
UNION CARBIDE CARIBE LLC
PEÑUELAS, PUERTO RICO

EXISTING CONDITIONS AND BATHYMETRY

CH2MHILL
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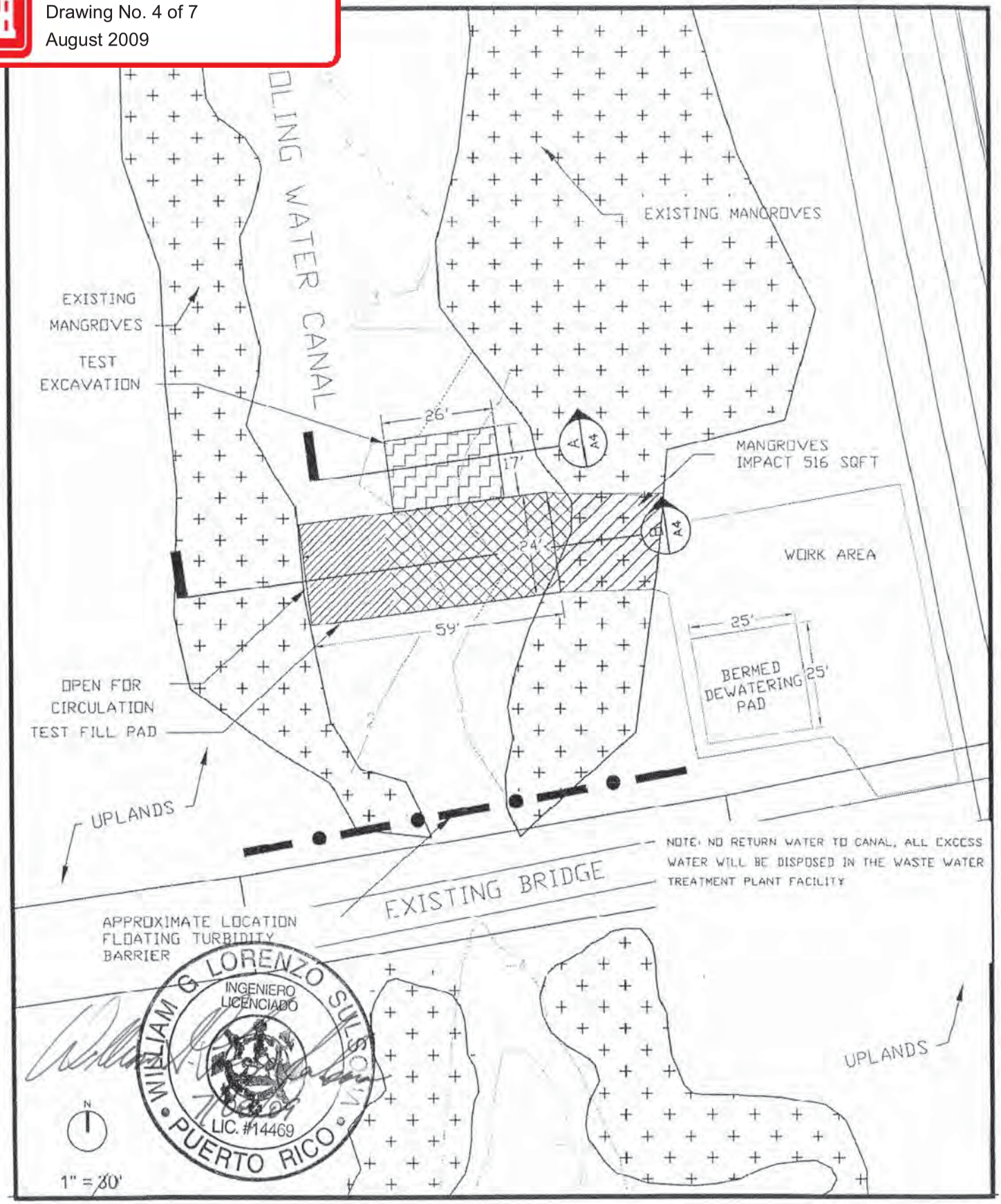
Suite # 600
Tampa, Florida
33607

JOB No. 387333
CAD FILE CAD FILE
SHEET NUMBER A2
SHEET OF

Permit No. SAJ-2009-2499
Drawing No. 4 of 7
August 2009



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PLOT SCALE:	–
DESIGNED:	DL
DRAWN:	BB
CHECKED:	RG
APPROVED:	WL
DATE:	5-2009

COOLING WATER CANAL (SWMU No 5) TREATABILITY PILOT STUDY

UNION CARBIDE CARIBE LLC

PEÑUELAS, PUERTO RICO

PROPOSED PILOT STUDY EXCAVATION AND FILL PAD

CH2MHILL
4350 W Cypress
Suite # 600
Tampa, Florida
33607

JOB No. 387333

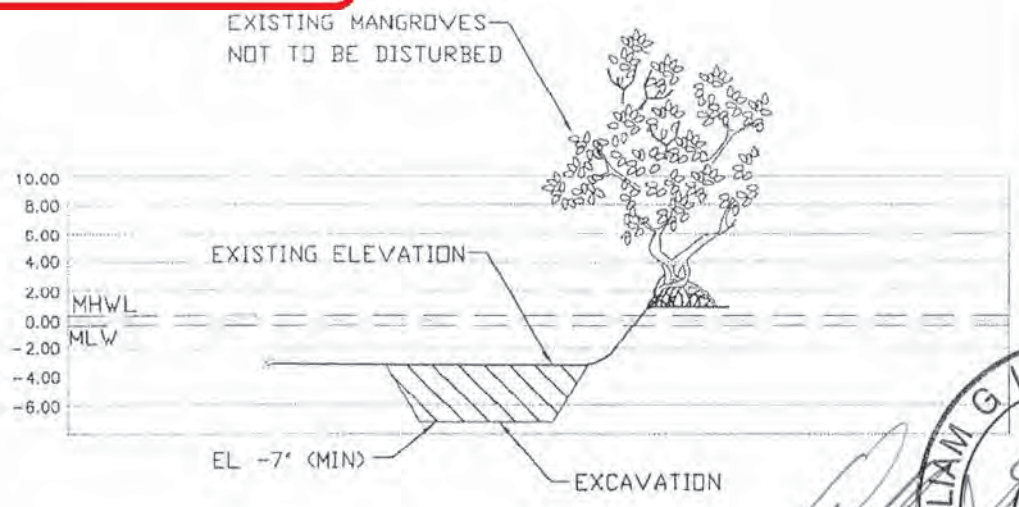
CAD FILE CAD FILE

SHEET NUMBER A3

SHEET OF

Permit No. SAJ-2009-2499
Drawing No. 5 of 7
August 2009

MHWL	0.34
MSL	0.0
MLW	-0.32



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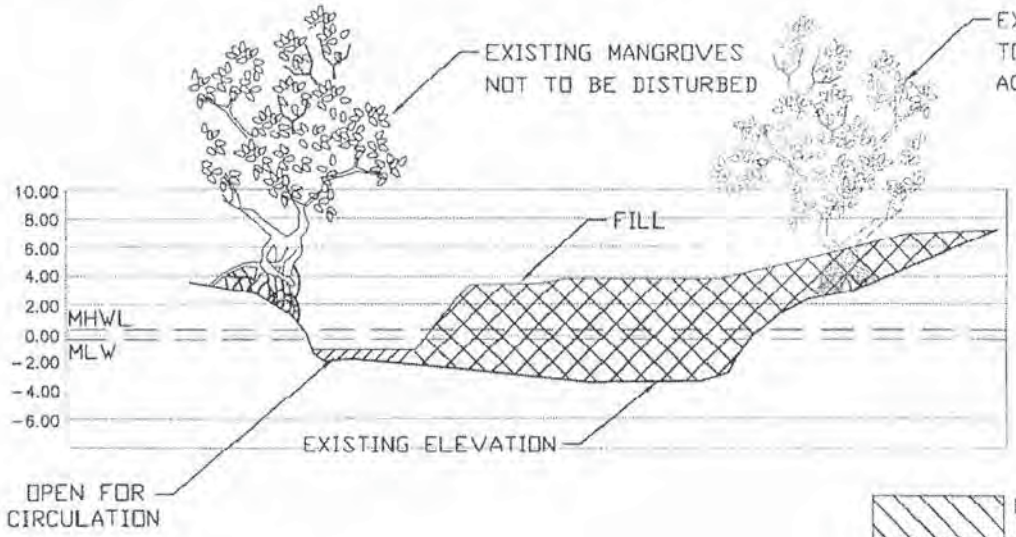
PUERTO RICO

A / A3 TEST EXCAVATION



EXCAVATION:
AREA 442 SQFT
VOLUME ±65 CY
BELOW MHWL

FILL:
AREA 1,416 SQFT
VOLUME ± 260 CY
WATERWARD OF MHWL

B / A3 TEST FILL PAD

NOTES:
1. EXCAVATON TO BE LEFT OPEN AFTER PILOT TESTING
2. FILL WILL LEFT INPLACE, WITH A PORTION BELOW MSL ON WEST SIDE OF CANAL FOR CIRCULATION
3. ALL ELEVATION MSL

PLOTTED:	-
TIME:	-
PLOT SCALE:	-
DESIGNED:	DL
DRAWN:	BB
CHECKED:	RC
APPROVED:	W.
DATE:	5-2009

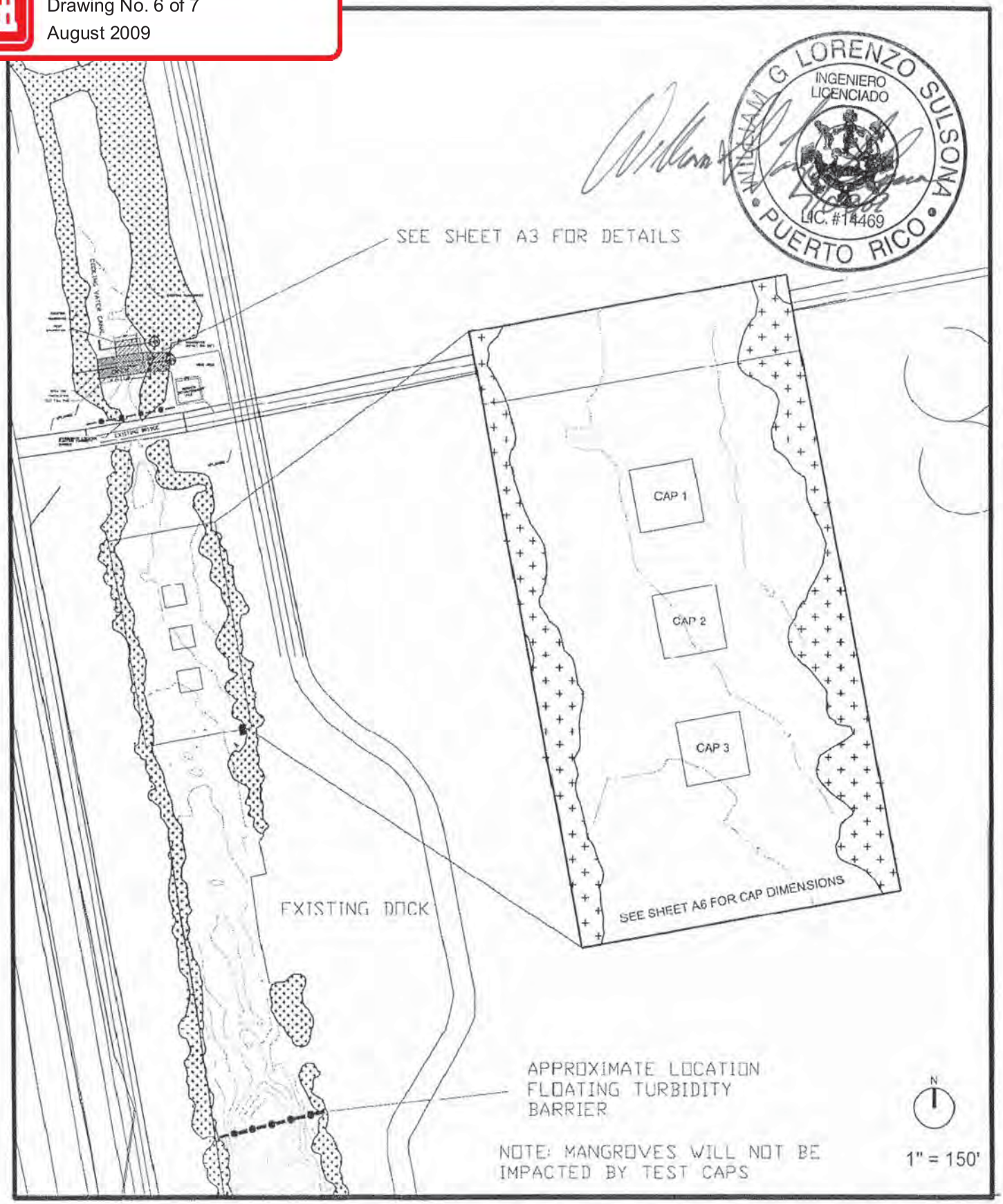
COOLING WATER CANAL (SWMU No 5) TREATABILITY PILOT STUDY
UNION CARBIDE CARIBE LLC
PEÑUELAS, PUERTO RICO

LOCATION

CH2MHILL
4350 W Cypress
Suite # 600
Tampa, Florida
33607

JOB No. 387333
CAD FILE CAD FILE
SHEET NUMBER A4
SHEET OF

Permit No. SAJ-2009-2499
Drawing No. 6 of 7
August 2009



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PLOT SCALE:	–
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DRAWN:	SG
CHECKED:	RG
APPROVED:	WL
DATE:	5-2009

COOLING WATER CANAL (SWMU No 5) TREATABILITY PILOT STUDY

UNION CARBIDE CARIBE LLC

PEÑUELAS, PUERTO RICO

TEST CAPS

CH2MHILL

4350 W Cypress
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Tampa, Florida
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JOB No. 387333

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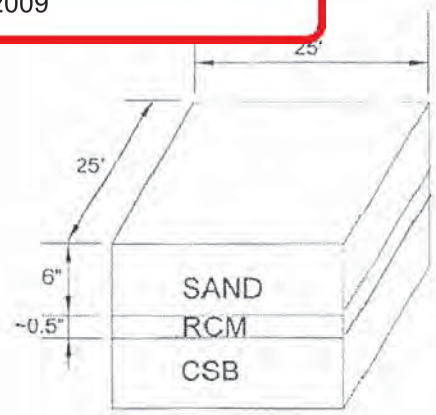
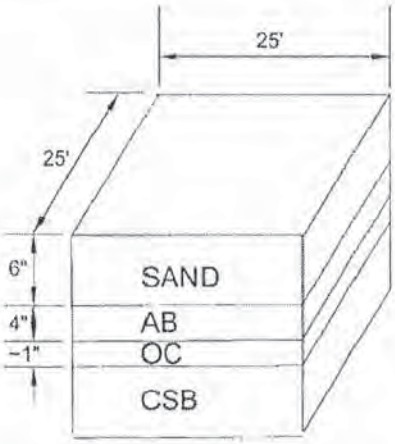
SHEET NUMBER A5

SHEET OF

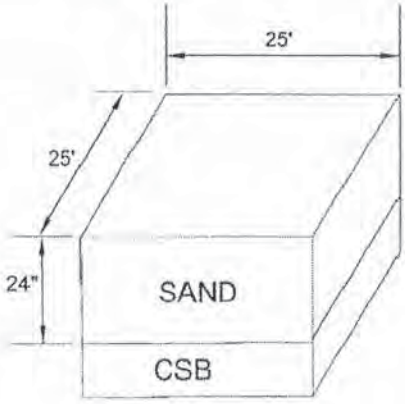
Permit No. SAJ-2009-2499
Drawing No. 7 of 7
August 2009



CAP 1



CAP 2



CAP 3

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LEGEND

AB AQUABLOK
OC ORGANIC CLAY
CSB CONTAMINATED SEDIMENT BED
RCM REACTIVE CAPPING MAT

PLOTTED:	–
TIME:	–
PLOT SCALE:	–
DESIGNED:	DL
DRAWN:	BB
CHECKED:	RG
APPROVED:	WL
DATE:	5-2009

COOLING WATER CANAL (SWMU No 5) TREATABILITY PILOT STUDY
UNION CARBIDE CARIBE LLC
PEÑUELAS, PUERTO RICO

CAPPING DETAILS

CH2MHILL
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Tampa, Florida
33607

JOB No. 387333
CAD FILE CAD FILE
SHEET NUMBER A6
SHEET OF

Appendix B
CSA Report

Peñuelas Technology Park LLC
SWMU No. 5 Phase 2 Cap Pilot Study
Survey Report

April 2012

Prepared for:

CH2M HILL
3011 SW Williston Road
Gainesville, Florida 32608
Telephone: (352) 384-7108

Prepared by:

CSA International, Inc.
8502 SW Kansas Avenue
Stuart, Florida 34997
Telephone: (772) 219-3000

Table of Contents

Page

List of Tables

List of Figures

1.0 Introduction

CSA International, Inc. (CSA) was contracted by CH2M HILL to assist in conducting the Phase 2 Cap Pilot Study for the Solid Waste Management Unit (SWMU) No. 5 Canal Sampling/Treatability Study at the Peñuelas Technology Park LLC (PTPLLC) (formerly Union Carbide Caribe, LLC) facility in Peñuelas, Puerto Rico (**Figure 1**). The cooling water canal is designated as SWMU No. 5 in the Resource Conservation and Recovery Act (RCRA) Part B Permit for the facility because of the presence of contaminated sediments in the canal. Remediation requirements stipulated in the RCRA permit include capping the sediments in the canal.

Figure 1. General site location.

The Cap Pilot Study was designed to compare different capping technologies to determine which would be most suitable for capping the sediments in the SWMU No. 5 canal as required by the RCRA permit. Three capping technologies were identified by CH2M Hill for potential remediation use in the SWMU 5 canal:

- CETCO Reactive Core Mat (CETCO-RCM);
- AquaBlok; and
- sand.

CETCO-RCM and AquaBlok are new technologies, while the sand option is the standard technology used for sediment remediation. The pilot study design was to install three 25 by 25 ft areas ("caps"), one area for each capping technology, in the SWMU No. 5 canal, which is located on the west side of the PTPLLC property (**Figure 2**). The canal entrance opens into the north end of Tallaboa Bay. The three areas are located at the north end of the canal, just south of the vehicle bridge (**Figure 3**).

Figure 2. SWMU No. 5 cooling canal in relation to the Peñuelas Technology Park, LLC facility and Tallaboa Bay.

The primary objectives of the field operations were to install the three caps, collect pre- and post-installation side-scan sonar and bathymetry data at each cap location, and assist CH2M Hill personnel with other study-related tasks. This report describes the instrumentation, methodology, and approach used by CSA to complete the pre- and post-cap installation side-scan sonar and bathymetric surveys.

Figure 3. Planned cap installation areas and tide gauge location in the SWMU No. 5 cooling canal (caps not to scale, for illustrative purposes only).

2.0 Methods

2.1 PROJECT OPERATIONS AND SCHEDULE

CSA's primary role in this study was to conduct field operations by providing all necessary equipment and personnel to perform the pre- and post-cap installation side-scan sonar and bathymetric surveys. CSA also assisted CH2M Hill with sampling and testing, as well as placement of measuring devices in the canal. Field tasks included the following:

- conducting a pre-cap installation side-scan sonar survey to better define sediment surface and bottom characteristics in the canal;
- conducting pre- and post-cap installation side-scan sonar and bathymetric surveys in the canal at the three cap installation areas;
- assisting CH2M Hill with installation of capping materials; and
- assisting CH2M Hill with completion of other study-related tasks.

CSA field survey activities were conducted from 26 February to 4 March 2012 (**Table 1**). CSA field personnel included Frank Johnson (Operations Manager) and Terry Stevens (Lead Technician).

Table 1. Project schedule.

Date	Description
Sunday, 26 February 2012	CSA personnel travel to Puerto Rico
Monday, 27 February 2012	Project startup meetings Prepare equipment Install tide gauge
Tuesday, 28 February 2012	Safety Meeting Side-scan sonar system setup Conduct pre-cap install side-scan sonar survey Bathymetry system setup Conduct pre-cap installation bathymetric survey
Wednesday, 29 February 2012	Safety Meeting Bathymetry system setup Conduct pre-cap installation bathymetry survey Deploy north cap (CETCO-RCM) corner buoys North cap installed
Thursday, 1 March 2012	Safety Meeting Deploy center cap (AquaBlok) corner buoys Center cap installed
Friday, 2 March 2012	Safety Meeting Deploy south cap (sand) corner buoys South cap installed Conduct post-cap installation side-scan sonar and bathymetric surveys Retrieve tide gauge Demobilize survey vessel
Saturday, 3 March 2012	Complete demobilization of survey equipment from PTPLLC Transfer survey equipment to San Juan
Sunday, 4 March 2012	CSA personnel travel to U.S.

All field activities were conducted according to procedures outlined in the project-specific CH2M Hill SWMU No. 5 Phase 2 Implementation Cap Pilot Study Field Work Sampling and Analysis Plan.

2.2 VESSEL AND POSITIONING

Pre- and post side-scan sonar and bathymetric surveys were conducted from a 27-ft Prestige center console inflatable/fiberglass rib survey vessel powered by a Yamaha 200-hp outboard engine (**Figure 4**). Navigation and survey systems were mobilized on the vessel and calibrated prior to the start of field operations. Pre-planned transects for all surveys were generated at CSA's office prior to the field survey; side-scan sonar and bathymetric transects were altered as necessary in the field to best fit the canal area and cap locations.

Figure 4. Field operations survey vessel.

Navigation and geo-referenced data were collected with CSA's Navigation and Data Acquisition System (NADAS), a modular computer software and hardware package interfaced with a differential global positioning system (DGPS). The foundation of the NADAS is Coastal Oceanographics Hypack for Windows software. The system was used during the field surveys for vessel guidance, real-time vessel track plotting, and data logging. The survey vessel navigation system was a Trimble SPS461 dual antenna DGPS receiver; a complete backup DGPS also was available on site in the event that the primary system malfunctioned. Differential corrections were acquired from the U.S. Coast Guard beacon station in Isabela, located on the northwest end of the island. The geodesy used for this project was Puerto Rico/Virgin Islands State Plane North American Datum 1983 Zone 5200 (units are in feet). All navigational data were stored on the computer's hard drive and backed up on external hard drives.

2.3 SIDE-SCAN SONAR AND BATHYMETRIC SURVEYS

The canal surveys consisted of the collection of side-scan sonar and bathymetric profiling data prior to and immediately after cap installations. Primary canal survey transect lines were oriented parallel to the canal length at a 50-ft line spacing between the canal entrance and the vehicle bridge. For the pre- and post-installation surveys of the three cap areas being compared, an approximate 5-ft line spacing was used. Because of the size of the cap areas (i.e., 25 x 25 ft) and the manuverability of the survey vessel, several survey data collection transects were conducted over each cap. While surveying, vessel speed along each transect was maintained at approximately 2 to 3 kn.

Side-Scan Sonar

Side-scan sonar data were collected with a Klein 3000 dual frequency digital imaging side-scan sonar system using Klein's SonarPro software. The side-scan sonar system was interfaced with

CSA's NADAS to assist with vessel positioning during the field survey. Slant range for the side-scan survey was set at 25 m, with a resulting swath width of 50 m. In addition, a Humminbird 1198c bathymetry/side-scan sonar system was used to collect data for comparison with the Klein 3000 system.

Bathymetry

Bathymetric data were collected with an Odom Echotrac MK2 precision survey echosounder system interfaced with Coastal Oceanographic's Hypack software. A 200-kHz transducer was connected to the topside system to collect high-resolution depth data. The echosounder system was interfaced with CSA's NADAS to assist with vessel positioning during the bathymetric survey.

Tide Gauge

A Coastal Leasing Micro-Tide digital recording tide gauge was installed at a survey benchmark located near the boat house (**Figure 3**) prior to conducting the canal surveys. The tide gauge recorded water level changes within the canal. The tidal data were used to correct bathymetric data collected during the pre- and post-bathymetric surveys.

Data Processing

Windows-based software programs were used to view and process all side-scan sonar and bathymetric data collected during the survey. Data were saved in a raw format until additional post-processing could be conducted after the survey was completed. Notes were recorded concerning data collected, surveyed transects, direction of survey, and any observed features or structures; in addition, observed features or structures of interest (targets) were selected and their positions recorded for the subsequent post-survey analysis.

Chesapeake's SonarWIz software was used to post-process the side-scan sonar data files. Adjustments to beam angle, gain and attenuation controls, and the application of bottom tracking corrections were made to the individual raw data files, resulting in enhancement of seafloor features for interpretation and visualization purposes. Canal and pre- and post-cap installation side-scan sonar data were processed and analyzed to produce image files. Although both 100-kHz and 500-kHz frequencies were recorded, only the 500-kHz data were used during processing because of the higher resolution. The image files were merged to create a single mosaic image of the canal. Post-processed survey mosaics were then saved as high-resolution geoTIFF files and converted to jpg image files for inclusion in this report.

Bathymetric data were processed with Coastal Oceanographic's Hypack software and analyzed to identify and correct navigation and depth errors. In addition, the data were corrected for tide and adjusted to Mean Sea Level (MSL). Tidal reductions were referenced from a site control point (3.08 ft MSL) located on a concrete bulkhead near the boat house; the site control point was referenced to a local National Geodetic Survey monument. Tidal reductions were calculated from data collected with a MicroTide digital recording tide gauge installed on the concrete bulkhead 4.72 ft below the site control point. A correction offset of -1.64 ft was applied to correct the collected soundings to the MSL vertical datum. Atmospheric pressure data were collected before the tide gauge deployment and used to compute an atmospheric pressure average, and an atmospheric pressure correction offset of -14.678 psi was applied to compensate for atmospheric pressure. Atmospheric pressure data also were collected when the tide gauge was retrieved and compared against the correction offset.

3.0 Results and Discussion

3.1 SIDE-SCAN SONAR SURVEYS

To document bottom conditions in the SWMU No. 5 canal prior to installation of three capping technologies, side-scan sonar data were collected from the entire canal, and in particular at the proposed cap installation areas. For presentation purposes in this report, a side-scan sonar mosaic image of the entire canal produced from the side-scan sonar data post-processing efforts is shown in three sections, in **Figures 5** (north section), **6** (center section), and **7** (south section). **Figure 8** shows an expanded view of the canal illustrating the combined pre-cap installation side-scan sonar and bathymetric data overlain by the three planned cap areas. **Figure 9** shows an expanded view of the canal illustrating the combined post-cap installation side-scan sonar and bathymetric data with the three planned and post cap areas.

Following installation of the three caps by CH2M Hill, a post-cap installation side-scan sonar survey was conducted. Detailed scaled images produced from the post-installation side-scan sonar data collected from the three cap areas are presented in **Figures 10** to **12**. Planned and post installation area boundaries are overlain on the side-scan data. In **Figure 10**, the CETCO-RCM cap material is clearly visible, and in **Figure 11**, the AquaBlok cap material is seen as a lighter color than the surrounding bottom. **Figure 12** shows the sand cap installation; the sand cap material is difficult to distinguish because the properties of the sand and natural bottom are similar in nature.

3.2 BATHYMETRIC SURVEYS

Bathymetric surveys were conducted before and after installation of the three caps by CH2M Hill. **Figures 13** and **14** illustrate the pre- and post-bathymetric data, respectively, in relation to the planned cap installation areas; a side-by-side comparison of the pre- and post-cap installation bathymetric data is shown in **Figure 15**.

Figures 13 to **15** show that changes in elevation occurred between the pre-cap installation bathymetric survey and the post-cap installation bathymetric survey. For the north cap (the CETCO-RCM material), the bathymetric data show an average elevation change of 1 ft. For the center cap (the AquaBlok material), the bathymetric data also show an average elevation change of 1 ft. For the south cap (sand), the bathymetric data show an average elevation change of 0.5 ft. The lower change in elevation for the sand cap is thought to be due to the sand sinking into the natural bottom.

3.3 SURVEY OBSERVATIONS

In reviewing the side-scan and bathymetric data, it was observed that the CETCO-RCM capping material was “folded” instead of spread evenly over the bottom. This resultant configuration of the CETCO-RCM is believed to be due to the sand, which was spread over the CETCO-RCM by the backhoe on the barge. The sand is heavier, i.e. greater density, than the existing canal bottom sediments. When the sand contacted the CETCO-RCM the weight of the sand effectively pushed the CETCO-RCM into the less dense/loosely consolidated canal bottom sediments.

Also, in reviewing the side-scan and bathymetric data for the second cap installation, which used AquaBlok as the capping material, it was observed that the AquaBlok was also pushed into the canal bottom sediments due to the placement of the heavier sand on top of the AquaBlok material.

In reviewing the side-scan and bathymetric data for the third cap installation that used only sand as the capping material, the sand appears to have settled into the canal bottom sediments. In the post installation side scan image of the sand cap, the sand shows up as a darker bottom contrast compared to the slightly lighter contrast for the canal bottom sediments.

The bathymetric data for all of the cap installations shows minimal elevation above the canal bottom, which is believed to be due to the sand pushing the CETCO-RCM and the AquaBlok materials into the canal bottom sediments and the third cap installation material, sand, settling into the sediments of the canal bottom.

Figure 5. Pre-cap installation side-scan sonar image with planned cap installation areas of the SWMU No. 5 canal, north section.

Figure 6. Pre-cap installation side-scan sonar image of the SWMU No. 5 canal, center section.

Figure 7. Pre-cap installation side-scan sonar image of the SWMU No. 5 canal, south section.

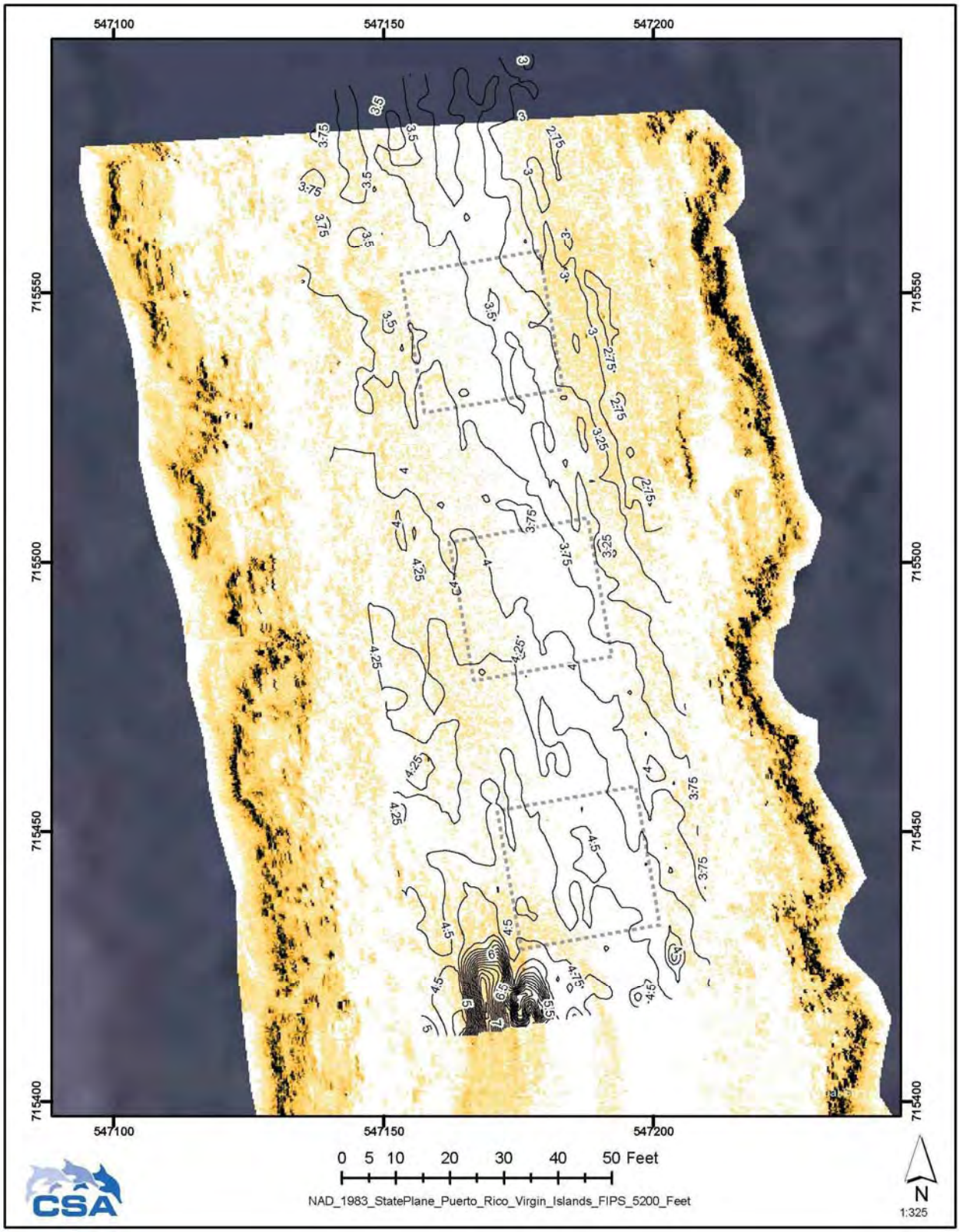


Figure 8. Planned cap installation areas in relation to the pre-cap installation side-scan sonar and bathymetric data.

Figure 9. Planned and Post (red dashed lines) cap installation areas in relation to the post side-scan sonar and bathymetric data.

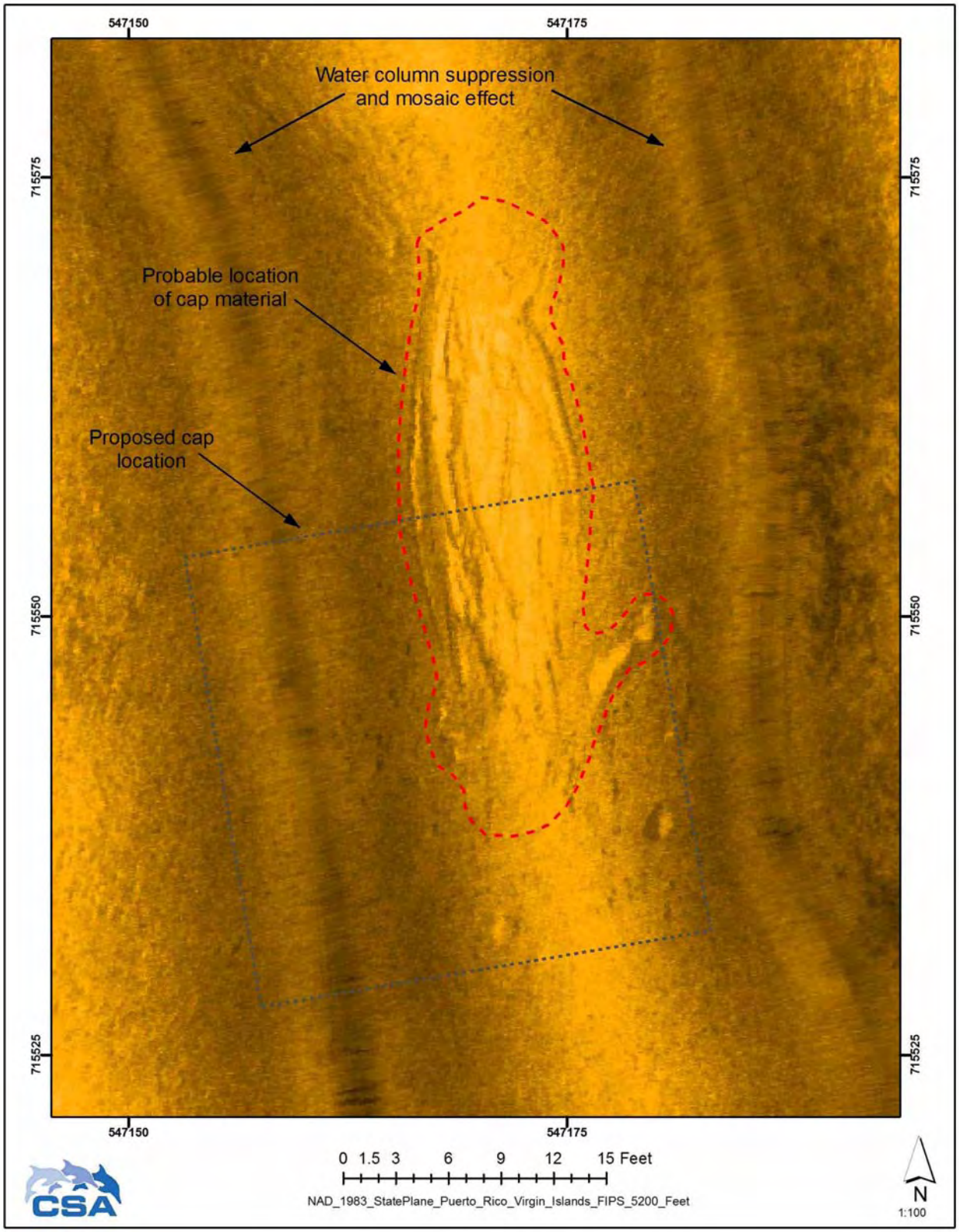


Figure 10. Post-cap installation side-scan sonar image of the CETCO-RCM installation area (north cap) with planned and post installation areas.

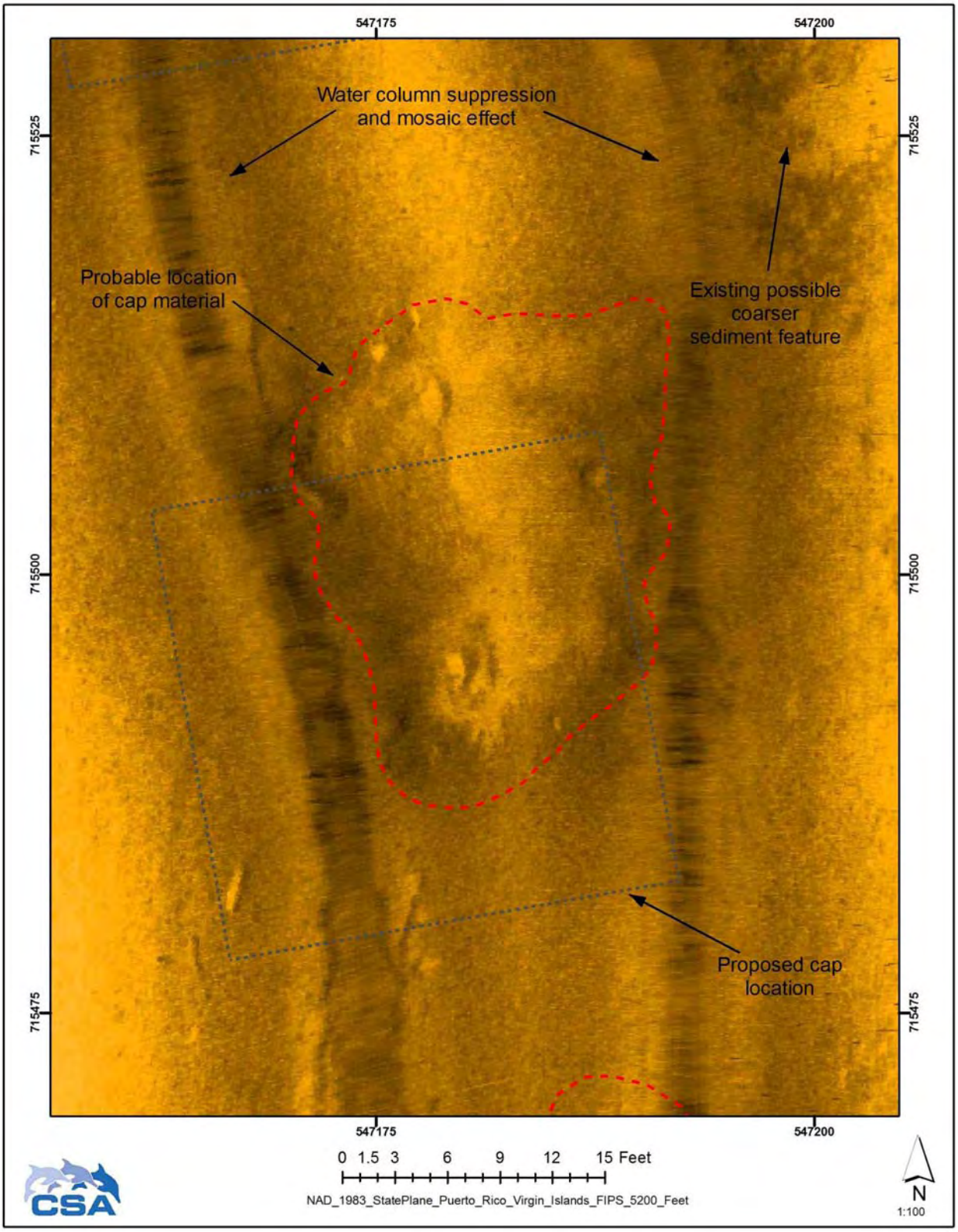


Figure 11. Post-cap installation side-scan sonar image of the AquaBlok installation area (center cap) with planned and post installation areas.

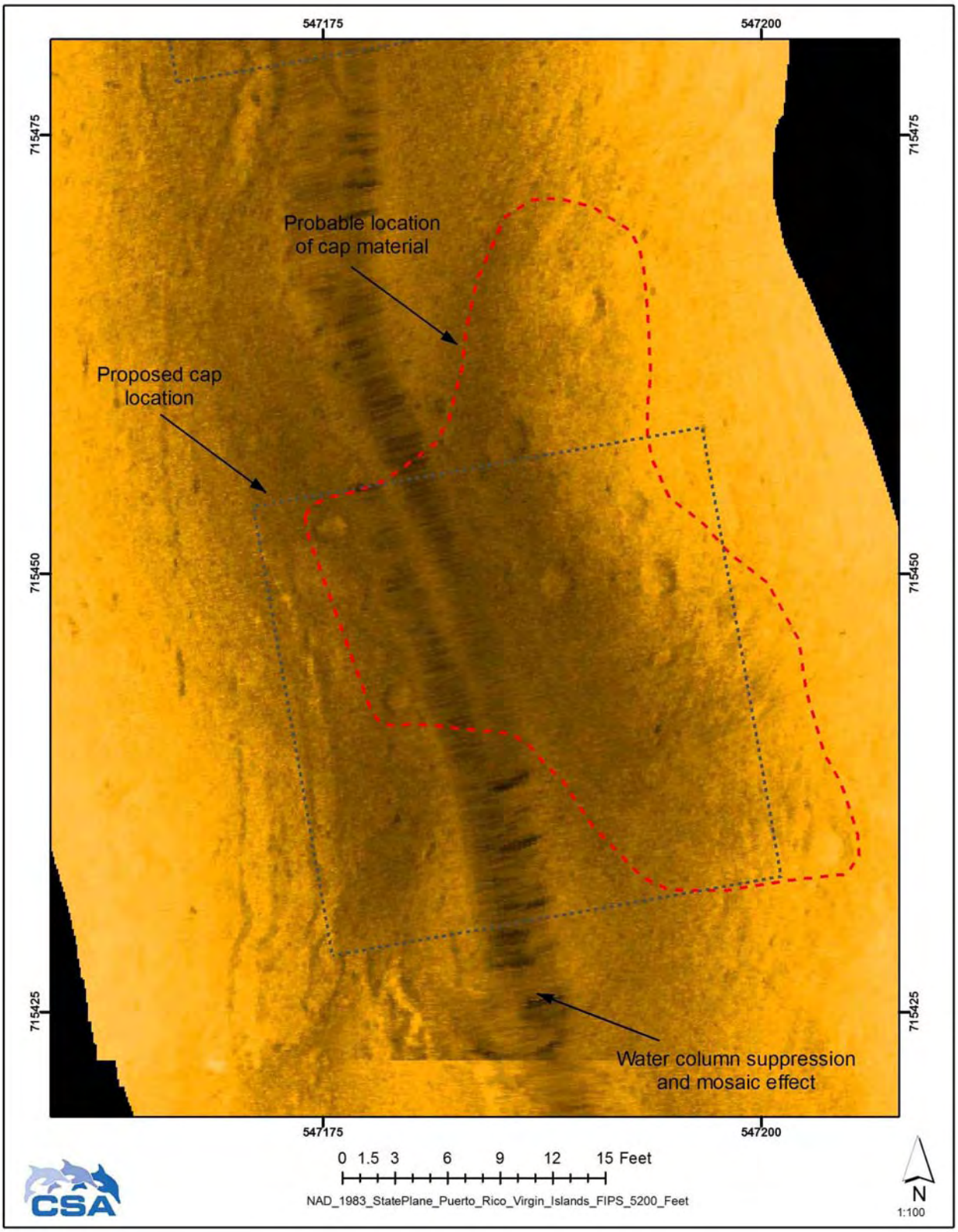


Figure 12. Post-cap installation side-scan sonar image of the sand installation area (south cap) with planned and post installation areas.

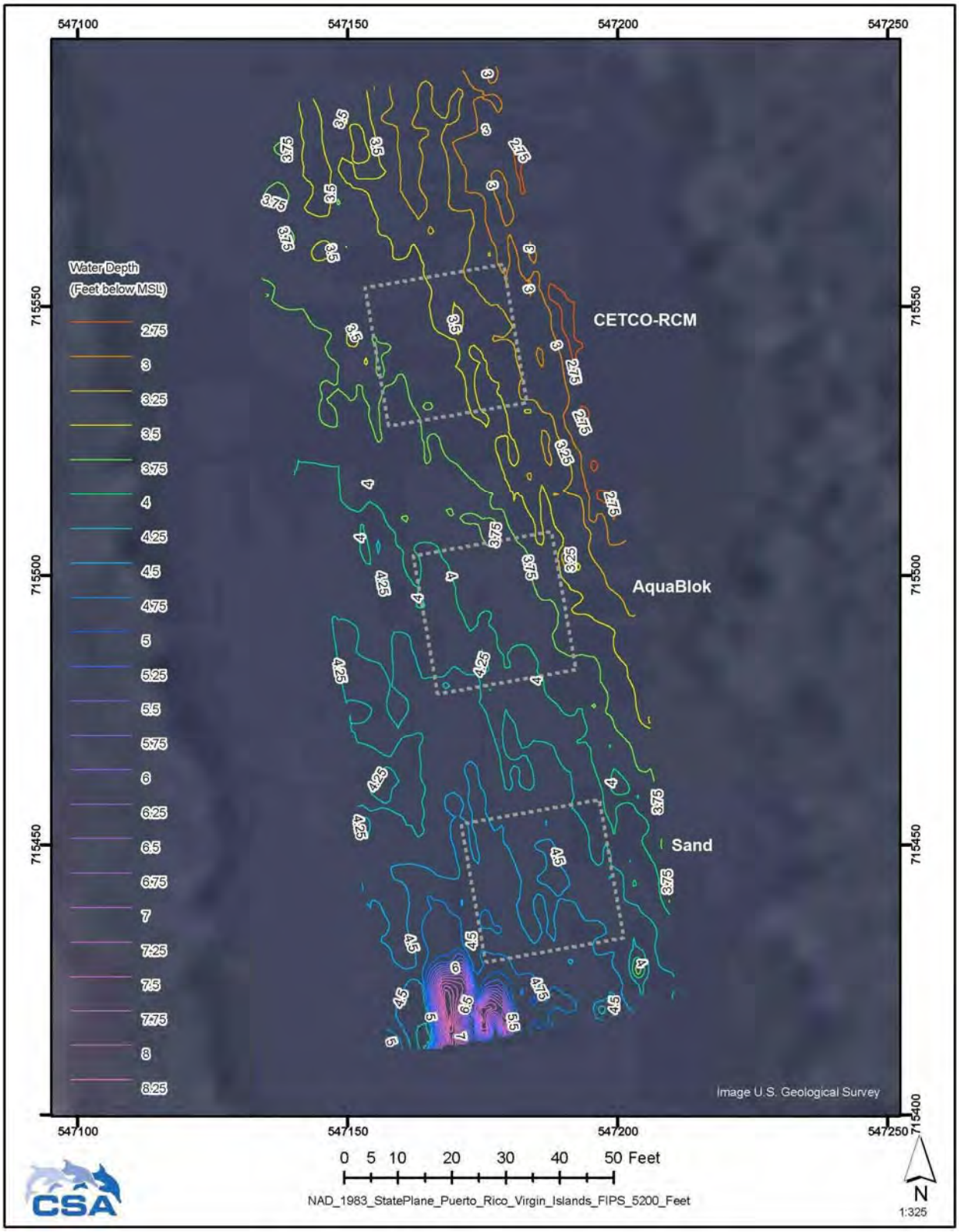


Figure 13. Pre-cap installation bathymetry in relation to the three planned cap installation areas.

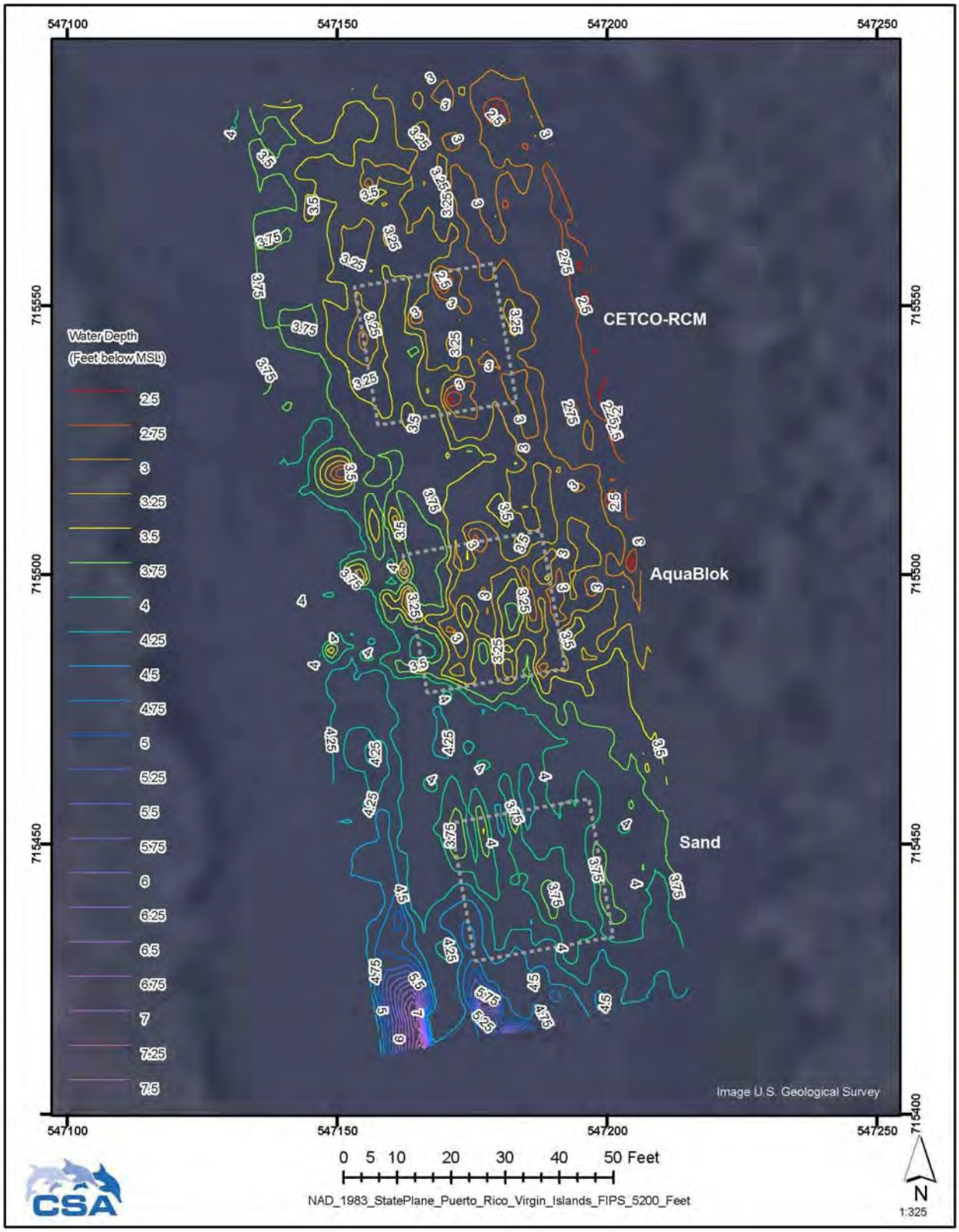


Figure 14. Post-cap installation bathymetry in relation to the three planned cap installation areas.

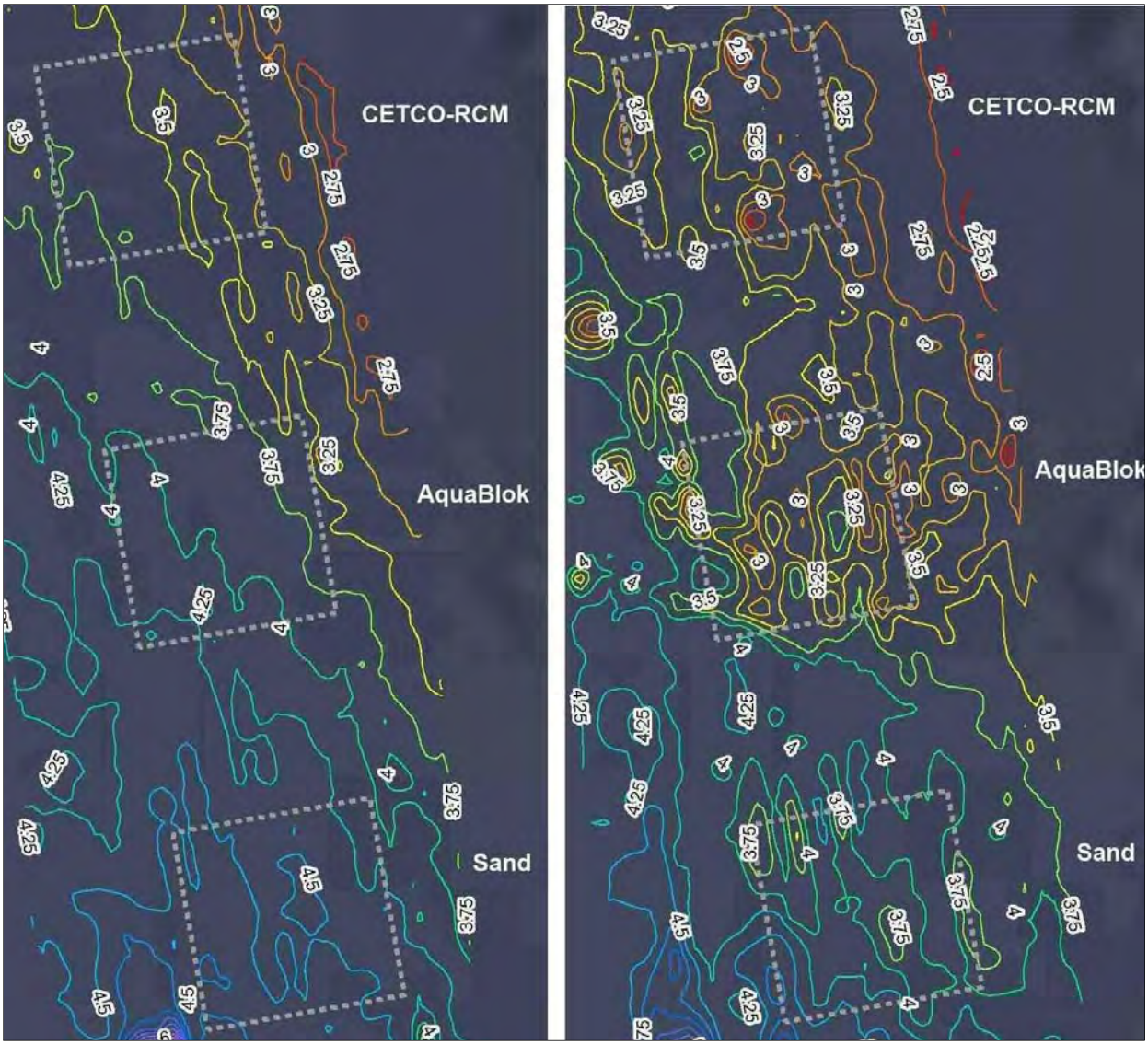


Figure 15. Pre-installation (left) and post-installation (right) bathymetry in relation to the planned cap installation areas.

Appendix C
Laboratory Data

Detects Screened

Analysis Method	Leach Method	CAS Number	Analyte	Units	November 2011 Residential RSL (ELCR = 1x10-6, HQ = 1.0)	2011 Background UTLs Min	2011 Background UTLs Max	SampleID :	Caliche 1 Tuque	Caliche 2 Tuque	Caliche 3 Tuque	Sand 1 Aguada	Sand 2 Aguada	Sand 3 Aguada	Sand 3 Aguada	Sand 1 AguadaLR
								Reference Sampl	Caliche 1 Tuque	Caliche 2 Tuque	Caliche 3 Tuque	Sand 1 Aguada	Sand 2 Aguada	Sand 3 Aguada	Sand 3 Aguada	Sand 1 Aguada
								Sample Type	N	N	N	N	N	N	FD	LR
								LR Type :								Dup
								Matrix :	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
								Date Collected	01/17/2012	01/17/2012	01/17/2012	01/17/2012	01/17/2012	01/17/2012	01/17/2012	01/17/2012
								Time Collected	09:00	09:00	09:00	09:15	09:15	09:15	09:15	09:15
								Lab SampleID	6524889	6524890	6524891	6524892	6524893	6524894	6524895	P524892D
								Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SM2540G	NONE	MOIST	MOISTURE	PERCENT	NA	--	--	**10.9**	=	**9.7**	=	**10.6**	=	**10**	=	**9.5**	=	**9.5**	=	**9.4**	=		
SW6010B	NONE	7429-90-5	ALUMINUM	MG/KG	77,000	35,000	35,000	**1790**	=	**1870**	=	**1850**	=	**6910**	=	**6770**	=	**6760**	=	**6820**	=	**6560**	=
SW6010B	NONE	7440-36-0	ANTIMONY	MG/KG	31	--	--	**1.91**	J	**2.35**	=	**1.98**	J	0.719	U	**0.856**	J	**1**	J	**0.742**	J	0.641	U
SW6010B	NONE	7440-38-2	ARSENIC	MG/KG	0.39	1.6	9.2	**7.33**	=	**6.94**	=	**7.53**	=	**10.4**	=	**10.1**	=	**10.2**	=	**10**	=	**8.91**	=
SW6010B	NONE	7440-39-3	BARIUM	MG/KG	15,000	--	--	**3.09**	=	**4.83**	=	**3.55**	=	**9.5**	=	**8.75**	=	**8.68**	=	**8.71**	=	**8.68**	=
SW6010B	NONE	7440-41-7	BERYLLIUM	MG/KG	160	0.27	0.95	0.015	U	0.0154	U	0.0152	U	**0.132**	J	**0.13**	J	**0.126**	J	**0.128**	J	**0.118**	J
SW6010B	NONE	7440-43-9	CADMIUM	MG/KG	70	2.2	2.4	0.0214	U	**0.0307**	J	0.0217	U	**0.169**	J	**0.153**	J	**0.155**	J	**0.141**	J	**0.15**	J
SW6010B	NONE	7440-70-2	CALCIUM	MG/KG	NA	--	--	**368000**	=	**357000**	=	**355000**	=	**76300**	=	**90000**	=	**87200**	=	**79500**	=	**71500**	=
SW6010B	NONE	7440-47-3	CHROMIUM	MG/KG	0.29	70	72	**15.4**	=	**15.8**	=	**16.3**	=	**16.7**	=	**17.8**	=	**17.7**	=	**17.8**	=	**17.2**	=
SW6010B	NONE	7440-48-4	COBALT	MG/KG	23	16	26	**0.297**	J	**0.322**	J	**0.319**	J	**4.92**	=	**5.12**	=	**4.97**	=	**4.88**	=	**4.85**	=
SW6010B	NONE	7440-50-8	COPPER	MG/KG	3,100	53	94	0.513	U	0.526	U	0.521	U	**9.21**	=	**9.69**	=	**9.48**	=	**9.04**	=	**8.54**	=
SW6010B	NONE	7439-89-6	IRON	MG/KG	55,000	38,100	43,200	**1780**	=	**1860**	=	**1880**	=	**11300**	=	**11300**	=	**11200**	=	**11200**	=	**11000**	=
SW6010B	NONE	7439-92-1	LEAD	MG/KG	400	5.4	16	**3.93**	J	**4.7**	J	**5.03**	J	**0.357**	J	**0.467**	J	**0.415**	J	**0.678**	J	**0.492**	J
SW6010B	NONE	7439-95-4	MAGNESIUM	MG/KG	NA	3,710	22,200	**11300**	=	**14400**	=	**15000**	=	**7600**	=	**8030**	=	**8150**	=	**7430**	=	**6910**	=
SW6010B	NONE	7439-96-5	MANGANESE	MG/KG	1,800	--	--	**20**	=	**27.6**	=	**22.3**	=	**182**	=	**203**	=	**186**	=	**184**	=	**202**	=
SW6010B	NONE	7440-02-0	NICKEL	MG/KG	1,500	22	41	**2.72**	=	**2.56**	=	**2.73**	=	**9.3**	=	**10.8**	=	**9.52**	=	**9.5**	=	**8.93**	=
SW6010B	NONE	2023695	POTASSIUM	MG/KG	NA	--	--	**134**	=	**131**	=	**121**	=	**534**	=	**512**	=	**531**	=	**525**	=	**486**	=
SW6010B	NONE	7440-23-5	SODIUM	MG/KG	NA	--	--	**320**	=	**326**	=	**348**	=	**596**	=	**594**	=	**668**	=	**628**	=	**558**	=
SW6010B	NONE	7440-62-2	VANADIUM	MG/KG	390	56	144	**15.3**	=	**16.5**	=	**16.9**	=	**36.3**	=	**36.2**	=	**36.1**	=	**36**	=	**34.8**	=
SW6010B	NONE	7440-66-6	ZINC	MG/KG	23,000	32	32	**3.73**	J	**3.32**	J	**3.91**	J	**21.5**	=	**22.9**	=	**21.6**	=	**21.7**	=	**20.9**	=
SW8081A	NONE	5103-74-2	GAMMA CHLORDANE	UG/KG	1,600	--	--	0.19	U	0.19	U	**0.27**	J	0.19	U	0.19	U	0.19	U	0.19	U		
SW8081A	NONE	1024-57-3	HEPTACHLOR EPOXIDE	UG/KG	53	--	--	0.19	U	0.19	U	0.19	U	**0.23**	J	0.19	U	0.19	U	0.19	U		
SW8082	NONE	12672-29-6	PCB-1248	UG/KG	220	--	--	3.7	U	3.7	U	3.7	U	3.7	U	3.6	U	**10**	J	3.6	U		
SW8260B	NONE	75-09-2	METHYLENE CHLORIDE	UG/KG	11,000	--	--	2	U	2	U	2	U	**5**	J	2	U	2	U	2	U		
SW8270C	NONE	91-57-6	2-METHYLNAPHTHALENE	UG/KG	310,000	--	--	**9**	J	4	U	4	U	4	U	4	U	4	U	4	U		
SW8270C	NONE	208-96-8	ACENAPHTHYLENE	UG/KG	3,400,000	--	--	**9**	J	4	U	4	U	4	U	4	U	4	U	4	U		
SW8270C	NONE	86-73-7	FLUORENE	UG/KG	2,300,000	--	--	**4**	J	4	U	4	U	4	U	4	U	4	U	4	U		
SW8270C	NONE	91-20-3	NAPHTHALENE	UG/KG	3,600	--	--	**5**	J	4	U	4	U	4	U	**4**	J	4	U	**6**	J		
SW8270C	NONE	85-01-8	PHENANTHRENE	UG/KG	17,000,000	--	--	4	U	4	U	4	U	4	U	**4**	J	**4**	J	4	U		

Bold = Detected

Exceeds November 2011 Residential RSL (ELCR = 1x10-6, HQ = 1.0)

Falls within the range and of minimum and maximum UTL

Exceeds November 2011 Residential RSL (ELCR = 1x10-6, HQ = 1.0); Within range of minimum and maximum soil UTLs

Exceeds November 2011 Residential RSL (ELCR = 1x10-6, HQ = 1.0); and the maximum UTL

2011 background data from :*An Evaluation of Environmental, Biological, and Health Data from the Island of Vieques (Public Comment) December 2011; US Department of Health and Human Services; Page 9&10*

Detects

					SampleID :	Caliche 1 Tuque		Caliche 2 Tuque		Caliche 3 Tuque		Sand 1 Aguada		Sand 2 Aguada		Sand 3 Aguada		Sand 3 Aguada		Sand 1 AguadaLR	
					Reference SampleID :	Caliche 1 Tuque		Caliche 2 Tuque		Caliche 3 Tuque		Sand 1 Aguada		Sand 2 Aguada		Sand 3 Aguada		Sand 3 Aguada		Sand 1 Aguada	
					Sample Type :	N		N		N		N		N		N		FD		LR	
					LR Type :															Dup	
					Matrix :	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
					Date Collected :	01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012	
					Time Collected :	09:00		09:00		09:00		09:15		09:15		09:15		09:15		09:15	
					Lab SampleID :	6524889		6524890		6524891		6524892		6524893		6524894		6524895		P524892D	
Analysis Method	Leach Method	CAS Number	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SM2540G	NONE	MOIST	MOISTURE	PERCENT	**10.9**	=	**9.7**	=	**10.6**	=	**10**	=	**9.5**	=	**9.5**	=	**9.4**	=		
SW6010B	NONE	7429-90-5	ALUMINUM	MG/KG	**1790**	=	**1870**	=	**1850**	=	**6910**	=	**6770**	=	**6760**	=	**6820**	=	**6560**	=
SW6010B	NONE	7440-36-0	ANTIMONY	MG/KG	**1.91**	J	**2.35**	=	**1.98**	J	0.719	U	**0.856**	J	**1**	J	**0.742**	J	0.641	U
SW6010B	NONE	7440-38-2	ARSENIC	MG/KG	**7.33**	=	**6.94**	=	**7.53**	=	**10.4**	=	**10.1**	=	**10.2**	=	**10**	=	**8.91**	=
SW6010B	NONE	7440-39-3	BARIUM	MG/KG	**3.09**	=	**4.83**	=	**3.55**	=	**9.5**	=	**8.75**	=	**8.68**	=	**8.71**	=	**8.68**	=
SW6010B	NONE	7440-41-7	BERYLLIUM	MG/KG	0.015	U	0.0154	U	0.0152	U	**0.132**	J	**0.13**	J	**0.126**	J	**0.128**	J	**0.118**	J
SW6010B	NONE	7440-43-9	CADMIUM	MG/KG	0.0214	U	**0.0307**	J	0.0217	U	**0.169**	J	**0.153**	J	**0.155**	J	**0.141**	J	**0.15**	J
SW6010B	NONE	7440-70-2	CALCIUM	MG/KG	**368000**	=	**357000**	=	**355000**	=	**76300**	=	**90000**	=	**87200**	=	**79500**	=	**71500**	=
SW6010B	NONE	7440-47-3	CHROMIUM	MG/KG	**15.4**	=	**15.8**	=	**16.3**	=	**16.7**	=	**17.8**	=	**17.7**	=	**17.8**	=	**17.2**	=
SW6010B	NONE	7440-48-4	COBALT	MG/KG	**0.297**	J	**0.322**	J	**0.319**	J	**4.92**	=	**5.12**	=	**4.97**	=	**4.88**	=	**4.85**	=
SW6010B	NONE	7440-50-8	COPPER	MG/KG	0.513	U	0.526	U	0.521	U	**9.21**	=	**9.69**	=	**9.48**	=	**9.04**	=	**8.54**	=
SW6010B	NONE	7439-89-6	IRON	MG/KG	**1780**	=	**1860**	=	**1880**	=	**11300**	=	**11300**	=	**11200**	=	**11200**	=	**11000**	=
SW6010B	NONE	7439-92-1	LEAD	MG/KG	**3.93**	J	**4.7**	J	**5.03**	J	**0.357**	J	**0.467**	J	**0.415**	J	**0.678**	J	**0.492**	J
SW6010B	NONE	7439-95-4	MAGNESIUM	MG/KG	**11300**	=	**14400**	=	**15000**	=	**7600**	=	**8030**	=	**8150**	=	**7430**	=	**6910**	=
SW6010B	NONE	7439-96-5	MANGANESE	MG/KG	**20**	=	**27.6**	=	**22.3**	=	**182**	=	**203**	=	**186**	=	**184**	=	**202**	=
SW6010B	NONE	7440-02-0	NICKEL	MG/KG	**2.72**	=	**2.56**	=	**2.73**	=	**9.3**	=	**10.8**	=	**9.52**	=	**9.5**	=	**8.93**	=
SW6010B	NONE	2023695	POTASSIUM	MG/KG	**134**	=	**131**	=	**121**	=	**534**	=	**512**	=	**531**	=	**525**	=	**486**	=
SW6010B	NONE	7440-23-5	SODIUM	MG/KG	**320**	=	**326**	=	**348**	=	**596**	=	**594**	=	**668**	=	**628**	=	**558**	=
SW6010B	NONE	7440-62-2	VANADIUM	MG/KG	**15.3**	=	**16.5**	=	**16.9**	=	**36.3**	=	**36.2**	=	**36.1**	=	**36**	=	**34.8**	=
SW6010B	NONE	7440-66-6	ZINC	MG/KG	**3.73**	J	**3.32**	J	**3.91**	J	**21.5**	=	**22.9**	=	**21.6**	=	**21.7**	=	**20.9**	=
SW8081A	NONE	5103-74-2	GAMMA CHLORDANE	UG/KG	0.19	U	0.19	U	**0.27**	J	0.19	U	0.19	U	0.19	U	0.19	U		
SW8081A	NONE	1024-57-3	HEPTACHLOR EPOXIDE	UG/KG	0.19	U	0.19	U	0.19	U	**0.23**	J	0.19	U	0.19	U	0.19	U		
SW8082	NONE	12672-29-6	PCB-1248	UG/KG	3.7	U	3.7	U	3.7	U	3.7	U	3.6	U	**10**	J	3.6	U		
SW8260B	NONE	75-09-2	METHYLENE CHLORIDE	UG/KG	2	U	2	U	2	U	**5**	J	2	U	2	U	2	U		
SW8270C	NONE	91-57-6	2-METHYLNAPHTHALENE	UG/KG	**9**	J	4	U	4	U	4	U	4	U	4	U	4	U		
SW8270C	NONE	208-96-8	ACENAPHTHYLENE	UG/KG	**9**	J	4	U	4	U	4	U	4	U	4	U	4	U		
SW8270C	NONE	86-73-7	FLUORENE	UG/KG	**4**	J	4	U	4	U	4	U	4	U	4	U	4	U		
SW8270C	NONE	91-20-3	NAPHTHALENE	UG/KG	**5**	J	4	U	4	U	4	U	**4**	J	4	U	**6**	J		
SW8270C	NONE	85-01-8	PHENANTHRENE	UG/KG	4	U	4	U	4	U	4	U	**4**	J	**4**	J	4	U		

All Results

			SampleID :	Caliche 1 Tuque		Caliche 2 Tuque		Caliche 3 Tuque		Sand 1 Aguada		Sand 2 Aguada		Sand 3 Aguada		Sand 3 Aguada		Sand 1 AguadaLR	
			Reference SampleID :	Caliche 1 Tuque		Caliche 2 Tuque		Caliche 3 Tuque		Sand 1 Aguada		Sand 2 Aguada		Sand 3 Aguada		Sand 3 Aguada		Sand 1 Aguada	
			Sample Type :	N		N		N		N		N		N		FD		LR	
			LR Type :															Dup	
			Matrix :	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			Date Collected :	01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012	
			Time Collected :	09:00		09:00		09:00		09:15		09:15		09:15		09:15		09:15	
			Lab SampleID :	6524889		6524890		6524891		6524892		6524893		6524894		6524895		P524892D	
Analysis Method	Leach Method	CAS Number	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SM2540G	NONE	MOIST	MOISTURE	PERCENT	**10.9**	=	**9.7**	=	**10.6**	=	**10**	=	**9.5**	=	**9.5**	=	**9.4**	=		
SW6010B	NONE	7429-90-5	ALUMINUM	MG/KG	**1790**	=	**1870**	=	**1850**	=	**6910**	=	**6770**	=	**6760**	=	**6820**	=	**6560**	=
SW6010B	NONE	7440-36-0	ANTIMONY	MG/KG	**1.91**	J	**2.35**	=	**1.98**	J	0.719	U	**0.856**	J	**1**	J	**0.742**	J	0.641	U
SW6010B	NONE	7440-38-2	ARSENIC	MG/KG	**7.33**	=	**6.94**	=	**7.53**	=	**10.4**	=	**10.1**	=	**10.2**	=	**10**	=	**8.91**	=
SW6010B	NONE	7440-39-3	BARIUM	MG/KG	**3.09**	=	**4.83**	=	**3.55**	=	**9.5**	=	**8.75**	=	**8.68**	=	**8.71**	=	**8.68**	=
SW6010B	NONE	7440-41-7	BERYLLIUM	MG/KG	0.015	U	0.0154	U	0.0152	U	**0.132**	J	**0.13**	J	**0.126**	J	**0.128**	J	**0.118**	J
SW6010B	NONE	7440-43-9	CADMIUM	MG/KG	0.0214	U	**0.0307**	J	0.0217	U	**0.169**	J	**0.153**	J	**0.155**	J	**0.141**	J	**0.15**	J
SW6010B	NONE	7440-70-2	CALCIUM	MG/KG	**368000**	=	**357000**	=	**355000**	=	**76300**	=	**90000**	=	**87200**	=	**79500**	=	**71500**	=
SW6010B	NONE	7440-47-3	CHROMIUM	MG/KG	**15.4**	=	**15.8**	=	**16.3**	=	**16.7**	=	**17.8**	=	**17.7**	=	**17.8**	=	**17.2**	=
SW6010B	NONE	7440-48-4	COBALT	MG/KG	**0.297**	J	**0.322**	J	**0.319**	J	**4.92**	=	**5.12**	=	**4.97**	=	**4.88**	=	**4.85**	=
SW6010B	NONE	7440-50-8	COPPER	MG/KG	0.513	U	0.526	U	0.521	U	**9.21**	=	**9.69**	=	**9.48**	=	**9.04**	=	**8.54**	=
SW6010B	NONE	7439-89-6	IRON	MG/KG	**1780**	=	**1860**	=	**1880**	=	**11300**	=	**11300**	=	**11200**	=	**11200**	=	**11000**	=
SW6010B	NONE	7439-92-1	LEAD	MG/KG	**3.93**	J	**4.7**	J	**5.03**	J	**0.357**	J	**0.467**	J	**0.415**	J	**0.678**	J	**0.492**	J
SW6010B	NONE	7439-95-4	MAGNESIUM	MG/KG	**11300**	=	**14400**	=	**15000**	=	**7600**	=	**8030**	=	**8150**	=	**7430**	=	**6910**	=
SW6010B	NONE	7439-96-5	MANGANESE	MG/KG	**20**	=	**27.6**	=	**22.3**	=	**182**	=	**203**	=	**186**	=	**184**	=	**202**	=
SW6010B	NONE	7440-02-0	NICKEL	MG/KG	**2.72**	=	**2.56**	=	**2.73**	=	**9.3**	=	**10.8**	=	**9.52**	=	**9.5**	=	**8.93**	=
SW6010B	NONE	2023695	POTASSIUM	MG/KG	**134**	=	**131**	=	**121**	=	**534**	=	**512**	=	**531**	=	**525**	=	**486**	=
SW6010B	NONE	7782-49-2	SELENIUM	MG/KG	0.727	U	0.746	U	0.738	U	0.741	U	0.722	U	0.737	U	0.715	U	0.66	U
SW6010B	NONE	7440-22-4	SILVER	MG/KG	0.0887	U	0.091	U	0.0901	U	0.0904	U	0.0882	U	0.0899	U	0.0872	U	0.0806	U
SW6010B	NONE	7440-23-5	SODIUM	MG/KG	**320**	=	**326**	=	**348**	=	**596**	=	**594**	=	**668**	=	**628**	=	**558**	=
SW6010B	NONE	7440-28-0	THALLIUM	MG/KG	0.385	U	0.395	U	0.391	U	0.392	U	0.382	U	0.39	U	0.378	U	0.35	U
SW6010B	NONE	7440-62-2	VANADIUM	MG/KG	**15.3**	=	**16.5**	=	**16.9**	=	**36.3**	=	**36.2**	=	**36.1**	=	**36**	=	**34.8**	=
SW6010B	NONE	7440-66-6	ZINC	MG/KG	**3.73**	J	**3.32**	J	**3.91**	J	**21.5**	=	**22.9**	=	**21.6**	=	**21.7**	=	**20.9**	=
SW7471A	NONE	7439-97-6	MERCURY	MG/KG	0.0074	U	0.0072	U	0.0073	U	0.0077	U	0.0075	U	0.0077	U	0.0074	U		
SW8081A	NONE	309-00-2	ALDRIN	UG/KG	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
SW8081A	NONE	319-84-6	ALPHA BHC	UG/KG	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
SW8081A	NONE	5103-71-9	ALPHA CHLORDANE	UG/KG	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
SW8081A	NONE	319-85-7	BETA BHC	UG/KG	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U
SW8081A	NONE	319-86-8	DELTA BHC	UG/KG	0.51	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
SW8081A	NONE	60-57-1	DIELDRIN	UG/KG	0.37	U	0.37	U	0.37	U	0.37	U	0.36	U	0.36	U	0.36	U	0.36	U
SW8081A	NONE	959-98-8	ENDOSULFAN I	UG/KG	0.25	U	0.24	U	0.25	U	0.24	U	0.24	U	0.24	U	0.24	U	0.24	U
SW8081A	NONE	33213-65-9	ENDOSULFAN II	UG/KG	0.37	U	0.37	U	0.37	U	0.37	U	0.36	U	0.36	U	0.36	U	0.36	U
SW8081A	NONE	1031-07-8	ENDOSULFAN SULFATE	UG/KG	0.37	U	0.37	U	0.37	U	0.37	U	0.36	U	0.36	U	0.36	U	0.36	U
SW8081A	NONE	72-20-8	ENDRIN	UG/KG	0.37	U	0.37	U	0.37	U	0.37	U	0.36	U	0.36	U	0.36	U	0.36	U
SW8081A	NONE	7421-93-4	ENDRIN ALDEHYDE	UG/KG	0.37	U	0.37	U	0.37	U	0.37	U	0.36	U	0.36	U	0.36	U	0.36	U
SW8081A	NONE	53494-70-5	ENDRIN KETONE	UG/KG	0.67	U	0.66	U	0.67	U	0.67	U	0.66	U	0.66	U	0.66	U	0.66	U
SW8081A	NONE	58-89-9	GAMMA BHC - LINDANE	UG/KG	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
SW8081A	NONE	5103-74-2	GAMMA CHLORDANE	UG/KG	0.19	U	0.19	U	**0.27**	J	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
SW8081A	NONE	76-44-8	HEPTACHLOR	UG/KG	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
SW8081A	NONE	1024-57-3	HEPTACHLOR EPOXIDE	UG/KG	0.19	U	0.19	U	0.19	U	**0.23**	J	0.19	U	0.19	U	0.19	U	0.19	U
SW8081A	NONE	72-43-5	METHOXYCHLOR	UG/KG	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U
SW8081A	NONE	72-54-8	P,P-DDD	UG/KG	0.37	U	0.37	U	0.37	U	0.37	U	0.36	U	0.36	U	0.36	U	0.36	U
SW8081A	NONE	72-55-9	P,P-DDE	UG/KG	0.37	U	0.37	U	0.37	U	0.37	U	0.36	U	0.36	U	0.36	U	0.36	U
SW8081A	NONE	50-29-3	P,P-DDT	UG/KG	0.37	U	0.37	U	0.37	U	0.37	U	0.36	U	0.36	U	0.36	U	0.36	U
SW8081A	NONE	8001-35-2	TOXAPHENE	UG/KG	13	U	13	U	13	U	13	U	13	U	13	U	13	U	13	U
SW8082	NONE	12674-11-2	PCB-1016	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U
SW8082	NONE	11104-28-2	PCB-1221	UG/KG	5.2	U	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U
SW8082	NONE	11141-16-5	PCB-1232	UG/KG	9	U	8.9	U	8.9	U	8.9	U	8.8	U	8.8	U	8.8	U	8.8	U
SW8082	NONE	53469-21-9	PCB-1242	UG/KG	3.7	U	3.7	U	3.7	U	3.7	U	3.6	U	3.6	U	3.6	U	3.6	U
SW8082	NONE	12672-29-6	PCB-1248	UG/KG	3.7	U	3.7	U	3.7	U	3.7	U	3.6	U	**10**	J	3.6	U	3.6	U
SW8082	NONE	11097-69-1	PCB-1254	UG/KG	3.7	U	3.7	U	3.7	U	3.7	U	3.6	U	3.6	U	3.6	U	3.6	U
SW8082	NONE	11096-82-5	PCB-1260	UG/KG	5.5	U	5.4	U	5.5	U	5.4	U	5.4	U	5.4	U	5.4	U	5.4	U

					SampleID :		Caliche 1 Tuque		Caliche 2 Tuque		Caliche 3 Tuque		Sand 1 Aguada		Sand 2 Aguada		Sand 3 Aguada		Sand 3 Aguada		Sand 1 AguadaLR
					Reference SampleID :		Caliche 1 Tuque		Caliche 2 Tuque		Caliche 3 Tuque		Sand 1 Aguada		Sand 2 Aguada		Sand 3 Aguada		Sand 3 Aguada		Sand 1 Aguada
					Sample Type :		N		N		N		N		N		N		FD		LR
					LR Type :																Dup
					Matrix :		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL
					Date Collected :		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012
					Time Collected :		09:00		09:00		09:00		09:15		09:15		09:15		09:15		09:15
					Lab SampleID :		6524889		6524890		6524891		6524892		6524893		6524894		6524895		P524892D
SW8151A	NONE	93-76-5	2,4,5-T	UG/KG		U	0.9	U	0.9	U	0.9	U	0.9	U	0.9	U	0.9	U	0.9	U	
SW8151A	NONE	93-72-1	2,4,5-TP	UG/KG	0.83	U	0.83	U	0.83	U	0.82	U	0.82	U	0.82	U	0.82	U	0.83	U	
SW8151A	NONE	94-75-7	2,4-D	UG/KG	13	U	13	U	13	U	13	U	13	U	13	U	13	U	13	U	
SW8151A	NONE	94-82-6	2,4-DB	UG/KG	6.8	U	6.8	U	6.8	U	6.8	U	6.8	U	6.8	U	6.8	U	6.8	U	
SW8151A	NONE	120-36-5	2,4-DP (DICHLOROPROP)	UG/KG	8.8	U	8.8	U	8.8	U	8.8	U	8.8	U	8.8	U	8.8	U	8.8	U	
SW8151A	NONE	75-99-0	DALAPON	UG/KG	49	U	48	U	49	U	48	U	48	U	48	U	48	U	48	U	
SW8151A	NONE	1918-00-9	DICAMBA	UG/KG	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	
SW8151A	NONE	88-85-7	DINOSEB	UG/KG	8.8	U	8.8	U	8.8	U	8.8	U	8.8	U	8.8	U	8.8	U	8.8	U	
SW8151A	NONE	94-74-6	MCPA	UG/KG	840	U	840	U	840	U	830	U	830	U	830	U	830	U	840	U	
SW8151A	NONE	93-65-2	MCPP (MECOPROP)	UG/KG	830	U	830	U	830	U	820	U	820	U	820	U	820	U	830	U	
SW8151A	NONE	87-86-5	PENTACHLOROPHENOL	UG/KG	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	
SW8260B	NONE	71-55-6	1,1,1-TRICHLOROETHANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	79-34-5	1,1,2,2-TETRACHLOROETHANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	79-00-5	1,1,2-TRICHLOROETHANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	75-34-3	1,1-DICHLOROETHANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	75-35-4	1,1-DICHLOROETHENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	120-82-1	1,2,4-TRICHLOROBENZENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	UG/KG	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	
SW8260B	NONE	106-93-4	1,2-DIBROMOETHANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	95-50-1	1,2-DICHLOROBENZENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	107-06-2	1,2-DICHLOROETHANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	78-87-5	1,2-DICHLOROPROPANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	541-73-1	1,3-DICHLOROBENZENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	106-46-7	1,4-DICHLOROBENZENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	78-93-3	2-BUTANONE	UG/KG	4	U	4	U	4	U	5	U	4	U	4	U	4	U	4	U	
SW8260B	NONE	591-78-6	2-HEXANONE	UG/KG	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	
SW8260B	NONE	108-10-1	4-METHYL-2-PENTANONE	UG/KG	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	
SW8260B	NONE	67-64-1	ACETONE	UG/KG	8	U	8	U	8	U	8	U	7	U	8	U	8	U	8	U	
SW8260B	NONE	71-43-2	BENZENE	UG/KG	0.5	U	0.6	U	0.6	U	0.6	U	0.5	U	0.6	U	0.6	U	0.6	U	
SW8260B	NONE	75-27-4	BROMODICHLOROMETHANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	75-25-2	BROMOFORM	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	74-83-9	BROMOMETHANE	UG/KG	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	
SW8260B	NONE	75-15-0	CARBON DISULFIDE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	56-23-5	CARBON TETRACHLORIDE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	108-90-7	CHLOROBENZENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	75-00-3	CHLOROETHANE	UG/KG	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	
SW8260B	NONE	67-66-3	CHLOROFORM	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	74-87-3	CHLOROMETHANE	UG/KG	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	
SW8260B	NONE	156-59-2	CIS-1,2-DICHLOROETHENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	10061-01-5	CIS-1,3-DICHLOROPROPENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	110-82-7	CYCLOHEXANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	124-48-1	DIBROMOCHLOROMETHANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	75-71-8	DICHLORODIFLUOROMETHANE	UG/KG	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	
SW8260B	NONE	100-41-4	ETHYLBENZENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	76-13-1	FREON 113	UG/KG	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	
SW8260B	NONE	98-82-8	ISOPROPYLBENZENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	79-20-9	METHYL ACETATE	UG/KG	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	
SW8260B	NONE	1634-04-4	METHYL TERTIARY BUTYL ETHER	UG/KG	0.5	U	0.6	U	0.6	U	0.6	U	0.5	U	0.6	U	0.6	U	0.6	U	
SW8260B	NONE	108-87-2	METHYLCYCLOHEXANE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	75-09-2	METHYLENE CHLORIDE	UG/KG	2	U	2	U	2	U	**5**	**J**	2	U	2	U	2	U	2	U	
SW8260B	NONE	100-42-5	STYRENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	127-18-4	TETRACHLOROETHENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	108-88-3	TOLUENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	156-60-5	TRANS-1,2-DICHLOROETHENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	10061-02-6	TRANS-1,3-DICHLOROPROPENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	

			SampleID :		Caliche 1 Tuque		Caliche 2 Tuque		Caliche 3 Tuque		Sand 1 Aguada		Sand 2 Aguada		Sand 3 Aguada		Sand 3 Aguada		Sand 1 AguadaLR
			Reference SampleID :		Caliche 1 Tuque		Caliche 2 Tuque		Caliche 3 Tuque		Sand 1 Aguada		Sand 2 Aguada		Sand 3 Aguada		Sand 3 Aguada		Sand 1 Aguada
			Sample Type :		N		N		N		N		N		N		FD		LR
			LR Type :																Dup
			Matrix :		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL
			Date Collected :		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012
			Time Collected :		09:00		09:00		09:00		09:15		09:15		09:15		09:15		09:15
			Lab SampleID :		6524889		6524890		6524891		6524892		6524893		6524894		6524895		P524892D
SW8260B	NONE	79-01-6	TRICHLOROETHENE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	75-69-4	TRICHLOROFLUOROMETHANE	UG/KG	2	U	2	U	2	U	2	U	2	U	2	U	2	U	
SW8260B	NONE	75-01-4	VINYL CHLORIDE	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8260B	NONE	1330-20-7	XYLENE (TOTAL)	UG/KG	1	U	1	U	1	U	1	U	1	U	1	U	1	U	
SW8270C	NONE	92-52-4	1,1'-BIPHENYL	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	108-60-1	2,2'-OXYBIS(1-CHLOROPROPANE)	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	95-95-4	2,4,5-TRICHLOROPHENOL	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	88-06-2	2,4,6-TRICHLOROPHENOL	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	120-83-2	2,4-DICHLOROPHENOL	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	105-67-9	2,4-DIMETHYLPHENOL	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	51-28-5	2,4-DINITROPHENOL	UG/KG	340	U	330	U	340	U	330	U	330	U	330	U	330	U	
SW8270C	NONE	121-14-2	2,4-DINITROTOLUENE	UG/KG	75	U	74	U	75	U	74	U	74	U	74	U	74	U	
SW8270C	NONE	606-20-2	2,6-DINITROTOLUENE	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	91-58-7	2-CHLORONAPHTHALENE	UG/KG	8	U	8	U	8	U	8	U	8	U	8	U	8	U	
SW8270C	NONE	95-57-8	2-CHLOROPHENOL	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	91-57-6	2-METHYLNAPHTHALENE	UG/KG	**9**	**J**	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	95-48-7	2-METHYLPHENOL	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	88-74-4	2-NITROANILINE	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	88-75-5	2-NITROPHENOL	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	91-94-1	3,3'-DICHLOROBENZIDINE	UG/KG	110	U	110	U	110	U	110	U	110	U	110	U	110	U	
SW8270C	NONE	99-09-2	3-NITROANILINE	UG/KG	75	U	74	U	75	U	74	U	74	U	74	U	74	U	
SW8270C	NONE	534-52-1	4,6-DINITRO-2-METHYLPHENOL	UG/KG	190	U	180	U	190	U	190	U	180	U	180	U	180	U	
SW8270C	NONE	101-55-3	4-BROMOPHENYL-PHENYLETHER	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	59-50-7	4-CHLORO-3-METHYLPHENOL	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	106-47-8	4-CHLOROANILINE	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	7005-72-3	4-CHLOROPHENYL-PHENYLETHER	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	106-44-5	4-METHYLPHENOL	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	100-01-6	4-NITROANILINE	UG/KG	75	U	74	U	75	U	74	U	74	U	74	U	74	U	
SW8270C	NONE	100-02-7	4-NITROPHENOL	UG/KG	190	U	180	U	190	U	190	U	180	U	180	U	180	U	
SW8270C	NONE	83-32-9	ACENAPHTHENE	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	208-96-8	ACENAPHTHYLENE	UG/KG	**9**	**J**	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	98-86-2	ACETOPHENONE	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	120-12-7	ANTHRACENE	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	1912-24-9	ATRAZINE	UG/KG	37	U	37	U	37	U	37	U	37	U	37	U	37	U	
SW8270C	NONE	100-52-7	BENZALDEHYDE	UG/KG	75	U	74	U	75	U	74	U	74	U	74	U	74	U	
SW8270C	NONE	56-55-3	BENZO(A)ANTHRACENE	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	50-32-8	BENZO(A)PYRENE	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	205-99-2	BENZO(B)FLUORANTHENE	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	191-24-2	BENZO(G,H,I)PERYLENE	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	207-08-9	BENZO(K)FLUORANTHENE	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	111-91-1	BIS(2-CHLOROETHOXY)METHANE	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	111-44-4	BIS(2-CHLOROETHYL)ETHER	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	75	U	74	U	75	U	74	U	74	U	74	U	74	U	
SW8270C	NONE	85-68-7	BUTYLBENZYLPHTHALATE	UG/KG	75	U	74	U	75	U	74	U	74	U	74	U	74	U	
SW8270C	NONE	105-60-2	CAPROLACTAM	UG/KG	37	U	37	U	37	U	37	U	37	U	37	U	37	U	
SW8270C	NONE	86-74-8	CARBAZOLE	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	218-01-9	CHRYSENE	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	84-74-2	DI-N-BUTYLPHTHALATE	UG/KG	75	U	74	U	75	U	74	U	74	U	74	U	74	U	
SW8270C	NONE	117-84-0	DI-N-OCTYLPHTHALATE	UG/KG	75	U	74	U	75	U	74	U	74	U	74	U	74	U	
SW8270C	NONE	53-70-3	DIBENZ(A,H)ANTHRACENE	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	132-64-9	DIBENZOFURAN	UG/KG	19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	84-66-2	DIETHYLPHTHALATE	UG/KG	75	U	74	U	75	U	74	U	74	U	74	U	74	U	
SW8270C	NONE	131-11-3	DIMETHYLPHTHALATE	UG/KG	75	U	74	U	75	U	74	U	74	U	74	U	74	U	
SW8270C	NONE	206-44-0	FLUORANTHENE	UG/KG	4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	86-73-7	FLUORENE	UG/KG	**4**	**J**	4	U	4	U	4	U	4	U	4	U	4	U	

					SampleID :		Caliche 1 Tuque		Caliche 2 Tuque		Caliche 3 Tuque		Sand 1 Aguada		Sand 2 Aguada		Sand 3 Aguada		Sand 3 Aguada		Sand 1 AguadaLR
					Reference SampleID :		Caliche 1 Tuque		Caliche 2 Tuque		Caliche 3 Tuque		Sand 1 Aguada		Sand 2 Aguada		Sand 3 Aguada		Sand 3 Aguada		Sand 1 Aguada
					Sample Type :		N		N		N		N		N		N		FD		LR
					LR Type :																Dup
					Matrix :		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL
					Date Collected :		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012		01/17/2012
					Time Collected :		09:00		09:00		09:00		09:15		09:15		09:15		09:15		09:15
					Lab SampleID :		6524889		6524890		6524891		6524892		6524893		6524894		6524895		P524892D
SW8270C	NONE	118-74-1	HEXACHLOROBENZENE	UG/KG		4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	87-68-3	HEXACHLOROBUTADIENE	UG/KG		19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	77-47-4	HEXACHLOROCYCLOPENTADIENE	UG/KG		190	U	180	U	190	U	190	U	180	U	180	U	180	U	
SW8270C	NONE	67-72-1	HEXACHLOROETHANE	UG/KG		37	U	37	U	37	U	37	U	37	U	37	U	37	U	
SW8270C	NONE	193-39-5	INDENO(1,2,3-CD)PYRENE	UG/KG		4	U	4	U	4	U	4	U	4	U	4	U	4	U	
SW8270C	NONE	78-59-1	ISOPHORONE	UG/KG		19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	621-64-7	N-NITROSO-DI-N-PROPYLAMINE	UG/KG		19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	86-30-6	N-NITROSODIPHENYLAMINE	UG/KG		19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	91-20-3	NAPHTHALENE	UG/KG		**5**	**J**	4	U	4	U	4	U	**4**	**J**	4	U	**6**	**J**	
SW8270C	NONE	98-95-3	NITROBENZENE	UG/KG		19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	87-86-5	PENTACHLOROPHENOL	UG/KG		37	U	37	U	37	U	37	U	37	U	37	U	37	U	
SW8270C	NONE	85-01-8	PHENANTHRENE	UG/KG		4	U	4	U	4	U	4	U	**4**	**J**	**4**	**J**	4	U	
SW8270C	NONE	108-95-2	PHENOL	UG/KG		19	U	18	U	19	U	19	U	18	U	18	U	18	U	
SW8270C	NONE	129-00-0	PYRENE	UG/KG		4	U	4	U	4	U	4	U	4	U	4	U	4	U	

Appendix D

CH2M HILL Field Daily Reports and Logs

DAILY REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

SOP ES-P6-01, Final, Rev 1

CONTRACT NAME:	SWMU 5 Pilot Study Cooling Water Canal	REPORT NO:	001
CONTRACT NUMBER:		REPORT DATE:	02-27-2012
REVISION NUMBER:		REVISION DATE: djl	03-01-2012
TASK ORDER NUMBER:	01.FA	PROJECT NAME / LOCATION:	Cooling Water Canal
PROJECT NUMBER:	199918	PROJECT DESCRIPTION:	Pilot Study
PROJECT MANAGER:	David Lane	FIELD QUALITY MANAGER:	Stephanie DeWitt
CONSTRUCTION MANAGER:	Erick Sepulveda	SITE SAFETY COORDINATOR:	Rick Gorsira

AM WEATHER:	Sunny, clear. Warm.	PM WEATHER:	Cloudy, warm.	MAX TEMP (F):	75	MIN TEMP (F):	71

SUMMARY OF WORK PERFORMED TODAY

0700 to 1005 Field team charter and PTSP with CH field team, OMI, Right Way Environmental Co (RWEC), and CSA
1000 Start site preparation activities,
CSA working on calibration of the underwater survey equipment and repaired boat (engine),
Installed sampling stations (half barrels for groundwater flux) in the canal,
Manatees present in the canal, work was hindered and stopped at times,
Markout of the access areas/work stations/areas to be cleared for backfill test,
Fencing removed for backfill test,
Begin preparing reactive mat for Cap 1 (layout and connecting panels),
Trackhoe received and inspected.
1800 CSA and RWEC offsite,
1815 CH off site.

HEALTH AND SAFETY REPORT

SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED (Include Observations, Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted:

Comprehensive Health and Safety kick-off meeting with all crew. STAC cards completed.

TAILGATE TOPICS:

- **Working over water, boat safety**
- **Heavy equipment,**
- **Weather, heat stress, hydration, biological hazards**
- **Strategy; Know the work, know the tools (PPE, construction…) needed, Know the Risks and potential hazards, Know how to mitigated them,**
- **Cutting tools-Chainsaws, Knives**
- **PPE requirements**
- **Line of sight,**
- **Team work; communication, policing each other, interventions**
- **Spill control**
- **Emergency response actions and table-top rehearsal**
- **Both in English and Spanish**

SAFE BEHAVIOR OBSERVATIONS: One SBO performed today.

OPERATIONS / PRODUCTION REPORT

WORK FORCE – CONTRACTOR AND SUBCONTRACTOR

Company	Cumulative Total of Work Hours From Previous Report	Total Hours Today	Total Work Hours From Start of Construction
CH2MHILL			
Rick Gorsira	51	11	62
Stephanie DeWitt	0	11	11
Erick Sepulveda	0	11	11
George Hicks	0	11	11

Right Way Environmental			
Francisco Centero	0	11	11
Pedro Sanchez	0	11	11
Miguel Padilla	0	11	11
Pedro Tejada	0	11	11
Luis Rios	0	11	11
Angel Ortiz	0	11	11
Hector Santiago	0	11	11
CSA			
Frank Johnson	0	11	11
Terry Stevens	0	11	11

EQUIPMENT ON HAND

Description of Equipment	Make/Model/Manufacturer	Equipment ID Number	Inspection Performed By
2-24 Ft OB boat			ES/RG
12' OB Zodiak			ES/RG
14' Canoe			ES/RG
780 John Deere Excavator			ES
6022 Off road Forklift (6500lb)			ES
Canal survey equipment			ES
Support trailer			ES
Porta Jon			ES
Farm pro chain saw, STIHL(18")			ES

COMMENTS (acceptance status, inspection findings, etc.):

Defective extender line found on trackhoe; in process of repairing before sub will be allowed to use equipment.

WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS

Performed Work / Test for Today: Set remaining half-barrels for groundwater flux testing.

Planned Work / Test for Tomorrow: Collect measurements: GW flux, turbidity measurements; deployment of turbidity curtains; receipt of barge; CSA canal surveys; loading of materials onto barge; clearing path for Backfill test; complete sewing the reactive mat.

Planned Work / Test for Next Week: None.

CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED (List any conflicts with the project [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**: Delay of barge receipt due to weather; necessary stop-work due to presence of manatees.**

VISITORS AND DISCUSSIONS: None.

QUALITY CONTROL REPORT

MATERIALS DELIVERED TO JOB SITE

Quantity/Volume/Weight	Description of Materials Received	Make/Model/Manufacturer	Material Lot Number	Inspection Performed By
1-50X5'	Turbidity curtain, Type I			
1-100X 5'	Turbidity curtain Type I			
1-100X 12'	Turbidity curtain Type I			
80 CMs	Sand			
80 CMs	Caliche			

18 sheets	0.5” Ply score(4X8)			
1-100X15’	Manatee netting			

COMMENTS (acceptance status, inspection findings, etc.): None.

INSPECTIONS PERFORMED

Task/Activity Inspected	Inspection Performed	Findings
Installation of turbidity curtain by the traffic bridge	Visual	Acceptable
Site prep	Visual	Acceptable
Installation of sampling stations	Visual	Acceptable
Trackhoe inspection	Visual	Defective; repairs required.

TESTS PERFORMED

Task/Activity Tested	Test Performed	Test Results (Pass/Fail) - Criteria
None.		

QUALITY ISSUES AND RESOLUTIONS: None.

SUBMITTALS INSPECTION / REVIEW

Submittal No.	Submittal Description	Specification/Plan Reference	Submittal Approved?		Comment/Reason/Action
		No new.	Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	

REGULATORY COMPLIANCE REPORT

PERMIT INSPECTIONS PERFORMED: Sand/caliche stockpile inspections performed. Stockpiles on plastic sheeting and covered; secured with sandbags. Good condition.

WASTE ACCUMULATION/STOCKPILE AREA INSPECTION

Inspection Performed By:		NA.		Signature of Inspector:			
Accumulation / Stockpile Area Inspected:		NA.					
No of Containers:		No of Tanks		No of Roll-Off Boxes:		No. of Drums	

Inspection Results: NA

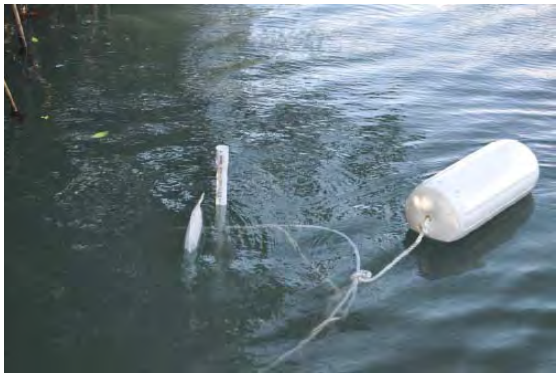
GENERAL COMMENTS

General Comments~ (rework, directives, etc.): None.

ATTACHMENTS		
List of Attachments: (examples, as applicable: submittals, meeting minutes, safety meeting minutes, COCs, weight tickets, manifests, profiles, rework item list, RFIs, DCNs, photographs, etc.): • Photo log. • Location of gas ebullition test areas.		
NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first and last name on each completed daily report. This form may be filled out electronically and signed electronically.	***Erick Sepulveda*** PREPARER'S SIGNATURE	2/27/2012 DATE

PHOTOGRAPHS

Subject/Description: Preparing a half-barrel for installation into the canal for groundwater flux testing. West side of Canal across from Boat dock; looking West from boat in canal. Photo Log No: 001	
Subject/Description: Installation of the half-barrel in canal. West side of Canal across from Boat dock; looking West from boat in canal. Photo Log No: 002	
Subject/Description: Installation of the half-barrel in canal. West side of Canal across from Boat dock; looking West from boat in canal. Photo Log No: 003	
Subject/Description: Installation of the half-barrel in canal. Hooking up tubing from half-barrel to bag. West side of Canal across from Boat dock; looking West from boat in canal. Photo Log No: 004	

Subject/Description: View of installed half-barrel and associated tubing/bag with buoy. The PVC is to help locate and remove the barrel. West side of Canal across from Boat dock; looking West from boat in canal.	
Photo Log No: 005	

GAS EBULLITION TEST DATA SHEET
DOW PTPLLC CWC Phase II Pilot Study

Test No.	DATE	TIME	CWC Station No. (North)	CWC Station No. (South)	Coordinates		Reading	Reading
HB-2	2/25/12	1650			1759.7979	66° 44.814	Start	
HB-3	2/25/12	1730	Moved from	planned loc.			Start	
HB-4	2/25/12	1750			1759.709	6644.796	Start	

DAILY REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

SOP ES-P6-01, Final, Rev 1

CONTRACT NAME:	SWMU 5 Pilot Study Cooling Water Canal	REPORT NO:	002
CONTRACT NUMBER:		REPORT DATE:	02-28-2012
REVISION NUMBER:		REVISION DATE: djl	03-01-2012
TASK ORDER NUMBER:	01.FA	PROJECT NAME / LOCATION:	Cooling Water Canal
PROJECT NUMBER:	199918	PROJECT DESCRIPTION:	Pilot Study
PROJECT MANAGER:	David Lane	FIELD QUALITY MANAGER:	Stephanie DeWitt
CONSTRUCTION MANAGER:	Erick Sepulveda	SITE SAFETY COORDINATOR:	Rick Gorsira

AM WEATHER:	Sunny, clear. Warm.	PM WEATHER:	Sunny, warm.	MAX TEMP (F):	79	MIN TEMP (F):	71

SUMMARY OF WORK PERFORMED TODAY

0700 to 0720 Daily Safety Meeting, STAC completion with CH field team, OMI, Right Way Environmental Co(RWEC), and CSA

0730 Continue site preparation activities:

CSA continued to work on calibration of the underwater survey equipment; completed pre-cap surveys,

Collected data from sampling stations (half barrels for groundwater flux and ebullition tests) in the canal,

Installed 2 turbidity curtains (uppermost and lower most) as well as manatee net,

Received barge, and provided safety briefing to crew,

Caliche re-positioned for Backfill test,

Reactive cap material sewed together for Cap 1,

Effected repairs to the track hoe (hydraulic line replacement), overheating problem will be addressed tomorrow.

1800 CSA and RWEC offsite,

1815 CH off site.

HEALTH AND SAFETY REPORT

SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED (Include Observations, Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted:

- Completed SBO – no at-risk behaviors observed
- Completed reinspection of trackhoe; defective line was repaired (See Self Assessment Checklist for Heavy Equipment)

TAILGATE TOPICS:

- Communication
- Working over water, boat safety
- Heavy equipment
- Weather, heat stress, hydration, biological hazards
- PPE for brush clearing
- PPE requirements
- Spill response
- Both in English and Spanish
- Working with heavy loads

SAFE BEHAVIOR OBSERVATIONS: One SBO performed today.

OPERATIONS / PRODUCTION REPORT

WORK FORCE – CONTRACTOR AND SUBCONTRACTOR

Company	Cumulative Total of Work Hours From Previous Report	Total Hours Today	Total Work Hours From Start of Construction
CH2MHILL			
Rick Gorsira	62	11	73
Stephanie DeWitt	11	11	22
Erick Sepulveda	11	11	22

George Hicks	11	11	22
Right Way Environmental			
Francisco Centero	11	11	22
Pedro Sanchez	11	11	22
Miguel Padilla	11	11	22
Pedro Tejada	11	11	22
Luis Rios	11	11	22
Angel Ortiz	11	11	22
Hector Santiago (Fuentes)	11	11	22
CSA			
Frank Johnson	11	11	22
Terry Stevens	11	11	22

EQUIPMENT ON HAND

Description of Equipment	Make/Model/Manufacturer	Equipment ID Number	Inspection Performed By
2-24Ft OB boat			ES/RG
12' OB Zodiak			ES/RG
14'Canoe			ES/RG
780 John Deere Excavator			ES
6022 Off road Forklift (6500lb)			ES
Canal survey equipment			ES
Support trailer			ES
Porta Jon			ES
Farm pro chain saw, STIHL(18")			ES

COMMENTS (acceptance status, inspection findings, etc.):

Defective extender line found on trackhoe yesterday was repaired today. Overheating problem developed, to be addressed tomorrow.

WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS

Performed Work / Test for Today: Continued site preparation activities: CSA continued to work on calibration of the underwater survey equipment; completed pre-cap surveys, collected data from sampling stations (half barrels for groundwater flux and ebullition tests) in the canal, installed 2 turbidity curtains (uppermost and lower most) as well as manatee net, received barge, and provided safety briefing to crew, caliche re-positioned for Backfill test, reactive cap material sewed together for Cap 1.

Planned Work / Test for Tomorrow: Collect GW flux and turbidity measurements, deploy third turbidity curtain; load sand and trackhoe onto barge, clearing path for Backfill test, complete backhoe test.

Planned Work / Test for Next Week: None.

CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED (List any conflicts with the project [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:** Barge was supposed to be refueled prior to getting to canal but it was not. Discussed plan for refueling, implemented spill response materials and provided close oversight during refueling in canal.

VISITORS AND DISCUSSIONS: Barge delivery crew; provided safety briefing.

QUALITY CONTROL REPORT

MATERIALS DELIVERED TO JOB SITE

Quantity/Volume/Weight	Description of Materials Received	Make/Model/Manufacturer	Material Lot Number	Inspection Performed By

1-50X5’	Turbidity curtain, Type I			
1-100X 5’	Turbidity curtain Type I			
1-100X 12’	Turbidity curtain Type I			
80CMs	Sand			
80CMs	Caliche			
18 sheets	0.5” Ply score(4X8)			
1-100X15’	Manatee netting			

COMMENTS (acceptance status, inspection findings, etc.): None.

INSPECTIONS PERFORMED

Task/Activity Inspected	Inspection Performed	Findings
Installation of turbidity curtain by the traffic bridge.	Visual	Acceptable
Site prep	Visual	Acceptable
Installation of sampling stations	Visual	Acceptable
Trackhoe inspection	Visual	Pending repair

TESTS PERFORMED

Task/Activity Tested	Test Performed	Test Results (Pass/Fail) - Criteria
Canal water	Turbidity	Comparative
Gas ebullition	Mass/weight	Fail
Groundwater Flux	Mass/weight	Data recorded (not pass or fail)
Canal water	PH/TSS	Pre construction

QUALITY ISSUES AND RESOLUTIONS: None.

SUBMITTALS INSPECTION / REVIEW

Submittal No.	Submittal Description	Specification/Plan Reference	Submittal Approved?		Comment/Reason/Action
		No new submittals.	Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	

REGULATORY COMPLIANCE REPORT

PERMIT INSPECTIONS PERFORMED: Sand/caliche stockpile inspections performed. Stockpiles on plastic sheeting and covered; secured with sandbags. Good condition.

WASTE ACCUMULATION/STOCKPILE AREA INSPECTION

Inspection Performed By:		NA.		Signature of Inspector:			
Accumulation / Stockpile Area Inspected:		NA.					
No of Containers:		No of Tanks		No of Roll-Off Boxes:		No. of Drums	

Inspection Results: NA

GENERAL COMMENTS
General Comments~ (rework, directives, etc.): None.
ATTACHMENTS
List of Attachments: (examples, as applicable: submittals, meeting minutes, safety meeting minutes, COCs, weight tickets, manifests, profiles, rework item list, RFIs, DCNs, photographs, etc.): • Photo log.

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first and last name on each completed daily report. This form may be filled out electronically and signed electronically.

Erick Sepulveda 2/28/2012

PREPARER'S SIGNATURE DATE

PHOTOGRAPHS

Subject/Description: View of reactive capping mat for Cap 1 (sewed together two pieces of liner material). Looking North at liner on ground. Photo Log No: 006	
Subject/Description: Area to be cleared for Backfill test. Looking NNW. View of general area to be cleared for the Backfill test. Photo Log No: 007	
Subject/Description: Area to be cleared for Backfill test. Looking West. View of path to be cleared down to the canal for the Backfill test. Photo Log No: 008	
Subject/Description: Survey equipment on CSA boat (in boathouse on canal). Photo Log No: 009	

Subject/Description: Survey equipment on CSA boat (in boathouse on canal).	
Photo Log No: 010	

DAILY REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

SOP ES-P6-01, Final, Rev 1

CONTRACT NAME:	SWMU 5 Pilot Study Cooling Water Canal	REPORT NO:	003
CONTRACT NUMBER:		REPORT DATE:	02-29-2012
REVISION NUMBER:		REVISION DATE: djl	03-01-2012
TASK ORDER NUMBER:	01.FA	PROJECT NAME / LOCATION:	Cooling Water Canal
PROJECT NUMBER:	199918	PROJECT DESCRIPTION:	Pilot Study
PROJECT MANAGER:	David Lane	FIELD QUALITY MANAGER:	Stephanie DeWitt
CONSTRUCTION MANAGER:	Erick Sepulveda	SITE SAFETY COORDINATOR:	Rick Gorsira

AM WEATHER:	Sunny, clear, warm.	PM WEATHER:	Sunny, clear, warm.	MAX TEMP (F):	86	MIN TEMP (F):	70

SUMMARY OF WORK PERFORMED TODAY

0700 to 0735 Daily Safety Meeting, STAC completion with CH field team, OMI, Right Way Environmental Co(RWEC), and CSA

0735 Crews head out:

CSA set buoys at corner boundaries of Cap #1 test location,

Collected data from sampling stations (half barrels for groundwater flux and turbidity) in the canal,

Third (middle) turbidity curtain installed,

Equipment and sand staged on barge,

Backfill test area clearing nearly completed,

Repairs made to track hoe (overheating problem addressed).

Completed Cap #1 Pilot Test.

1800 CSA and RWEC offsite

1815 CH off site.

HEALTH AND SAFETY REPORT

SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED (Include Observations, Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted:

- Completed re-inspection of track hoe; overheating problem addressed.
- Completed Boating Operations Checklist

TAILGATE TOPICS:

- Working over water, boat safety
- Slip trips and fall
- Discussed how cap material for Cap 1 will be deployed (techniques, boat safety, communication, anchoring, decon of anchors, if necessary.
- Heavy equipment safety
- Weather, heat stress, hydration, biological hazards
- Brush clearing hazards/controls, including steep slope; discussed process for backfill test
- Barge personnel segregation from work when heavy equipment is being used, PPE requirements
- Both in English and Spanish

SAFE BEHAVIOR OBSERVATIONS: No formal SBOs documented today.

OPERATIONS / PRODUCTION REPORT

WORK FORCE – CONTRACTOR AND SUBCONTRACTOR

Company	Cumulative Total of Work Hours From Previous Report	Total Hours Today	Total Work Hours From Start of Construction
CH2MHILL			
Rick Gorsira	73	10	83
Stephanie DeWitt	22	10	32
Erick Sepulveda	22	10	32

George Hicks	22	10	32
Right Way Environmental			
Francisco Centero	22	10	32
Pedro Sanchez	22	10	32
Miguel Padilla	22	10	32
Pedro Tejada	22	10	32
Luis Rios	22	10	32
Angel Ortiz	22	10	32
Hector Santiago (Fuentes)	22	10	32
CSA			
Frank Johnson	22	10	32
Terry Stevens	22	10	32

EQUIPMENT ON HAND

Description of Equipment	Make/Model/Manufacturer	Equipment ID Number	Inspection Performed By
2-24Ft OB boat			ES/RG
12' OB Zodiak			ES/RG
14'Canoe			ES/RG
780 John Deere Excavator			ES
6022 Off road Forklift (6500lb)			ES
Canal survey equipment			ES
Support trailer			ES
Porta Jon			ES
Farm pro chain saw, STIHL(18")			ES

COMMENTS (acceptance status, inspection findings, etc.):

Defective extender line found on trackhoe yesterday was repaired today. Overheating problem developed, to be addressed tomorrow.

WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS

Performed Work / Test for Today: CSA set buoys at corner boundaries of Cap #1 test location, collected data from sampling stations (half barrels for groundwater flux and turbidity) in the canal, installed (middle) turbidity curtain, staged sand and equipment on barge, completed as much vegetation clearing as possible to complete safely for backfill test area; will finish final clearing when some caliche has been pushed out, repairs made to track hoe (overheating problem addressed), completed Cap #1 Pilot test.

Planned Work / Test for Tomorrow: Collect GW flux and turbidity measurements, load aquablok, organoclay and sand onto barge, complete Cap #2 pilot test, begin/complete Backfill test.

Planned Work / Test for Next Week: None.

CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED (List any conflicts with the project [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:** windy conditions made it challenging especially during the cap installation. Difficult to control the water borne vessels.

VISITORS AND DISCUSSIONS: No visitors.

QUALITY CONTROL REPORT

MATERIALS DELIVERED TO JOB SITE

Quantity/Volume/Weight	Description of Materials Received	Make/Model/Manufacturer	Material Lot Number	Inspection Performed By

1-50X5’	Turbidity curtain, Type I			
1-100X 5’	Turbidity curtain Type I			
1-100X 12’	Turbidity curtain Type I			
80CMs	Sand			
80CMs	Caliche			
18 sheets	0.5” Ply score(4X8)			
1-100X15’	Manatee netting			

COMMENTS (acceptance status, inspection findings, etc.): None.

INSPECTIONS PERFORMED

Task/Activity Inspected	Inspection Performed	Findings
Installation of turbidity curtains; last curtain found to need expansion to reach sides of canal.	Visual	Acceptable/need to amend
Site prep	Visual	Acceptable
Trackhoe inspection	Visual	Pending repair

TESTS PERFORMED

Task/Activity Tested	Test Performed	Test Results (Pass/Fail) - Criteria
Canal water	Turbidity	Comparative
Gas ebullition	Mass/weight	Fail
Groundwater Flux	Mass/weight	Data recorded (not pass or fail)
Canal water	PAH/TSS	Completed pre-construction
Cap Profile depth	Bucket deposition measurement (inside)	Within range

QUALITY ISSUES AND RESOLUTIONS: None.

SUBMITTALS INSPECTION / REVIEW

Submittal No.	Submittal Description	Specification/Plan Reference	Submittal Approved?		Comment/Reason/Action
		No new submittals.	Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	

REGULATORY COMPLIANCE REPORT

PERMIT INSPECTIONS PERFORMED: Sand/caliche stockpile inspections performed. Stockpiles on plastic sheeting and covered; secured with sandbags. Good condition.

WASTE ACCUMULATION/STOCKPILE AREA INSPECTION							
Inspection Performed By:		NA.		Signature of Inspector:			
Accumulation / Stockpile Area Inspected:		NA.					
No of Containers:		No of Tanks		No of Roll-Off Boxes:		No. of Drums	
Inspection Results: NA							

GENERAL COMMENTS

General Comments~ (rework, directives, etc.): None.

ATTACHMENTS

List of Attachments: (examples, as applicable: submittals, meeting minutes, safety meeting minutes, COCs, weight tickets, manifests, profiles, rework item list, RFIs, DCNs, photographs, etc.):

- Photo log.

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first and last name on each completed daily report. This form may be filled out electronically and signed electronically.

Erick Sepulveda 2/29/2012

PREPARER'S SIGNATURE DATE

PHOTOGRAPHS

Subject/Description: Backfill test area being cleared. Looking west toward canal.	
Photo Log No: 011	
Subject/Description: View down embankment of backfill test area. Looking west toward canal.	
Photo Log No: 012	
Subject/Description: Additional clearing at backfill test area. Looking west down embankment toward canal.	
Photo Log No: 013	
Subject/Description: Barge at boat dock. Looking west.	
Photo Log No: 014	

Subject/Description: Barge at boat dock. Looking west. Photo Log No: 015	
Subject/Description: Trackhoe on barge at boat dock. Looking west. Photo Log No: 016	
Subject/Description: Placing sand for Cap #1 test onto barge. Looking NW. Photo Log No: 017	
Subject/Description: Buoys indicating boundaries of Cap #1 prior to pilot test. Looking south from pedestrian bridge. Photo Log No: 018	

Subject/Description: Moving toward Cap #1 Location. Looking North. Photo Log No: 019	
Subject/Description: Lowering spud at Cap #1 Location. Looking North Photo Log No: 020	
Subject/Description: First attempt to deploy reactive cap using boats at Cap #1. Looking North Photo Log No: 021	
Subject/Description: Bucket helping deploy reactive cap material at Cap #1. Looking North. Photo Log No: 022	
Subject/Description: View of deploying reactive cap from boat in canal. Looking SSE. Photo Log No: 023	

Subject/Description: Lowering buckets for sand depth gauge at Cap #1 prior to applying sand cover. View of North end of boat, looking east. Photo Log No: 024	
Subject/Description: Applying sand to Cap #1. Looking North. Photo Log No: 025	
Subject/Description: Depth of sand measurement at Cap #1 Location. Photo Log No: 026	
Subject/Description: Depth of sand measurement at Cap #1; last measurement in central portion of cap. Photo Log No: 027	
Subject/Description: End of day view of clearing at backfill test area. Looking west down embankment toward canal. Photo Log No: 028	

Subject/Description: View of turbidity curtain #2 (top third of picture) and floating boom around barge. Looking SW. Photo Log No: 029	

DAILY REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

SOP ES-P6-01, Final, Rev 1

CONTRACT NAME:	SWMU 5 Pilot Study Cooling Water Canal	REPORT NO:	004
CONTRACT NUMBER:		REPORT DATE:	03-01-2012
REVISION NUMBER:		REVISION DATE: djl	03-02-2012
TASK ORDER NUMBER:	01.FA	PROJECT NAME / LOCATION:	Cooling Water Canal
PROJECT NUMBER:	199918	PROJECT DESCRIPTION:	Pilot Study
PROJECT MANAGER:	David Lane	FIELD QUALITY MANAGER:	Stephanie DeWitt
CONSTRUCTION MANAGER:	Erick Sepulveda	SITE SAFETY COORDINATOR:	Rick Gorsira

AM WEATHER:	Sunny, clear, warm.	PM WEATHER:	Heavy rains after 1720	MAX TEMP (F):	85	MIN TEMP (F):	70

SUMMARY OF WORK PERFORMED TODAY

0700 to 0725 Daily Safety Meeting, STAC completion with CH field team, OMI, Right Way Environmental Co(RWEC), and CSA

0725 Crews head out:

CSA set buoys at corner boundaries of Cap #2 test location,

Collected data from sampling stations (half barrels for groundwater flux and turbidity) in the canal,

Collected canal water samples for PAHs and TSS,

The southernmost turbidity curtain was repaired (#3) as well as the curtain by the traffic bridge (northern most, #1),

The activated media and sand loaded on the barge,

Backfill test started, ~ 70% completed,

Completed Cap #2 Pilot Test.

1800 CSA and RWEC offsite

1900 CH off site.

HEALTH AND SAFETY REPORT

SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED (Include Observations, Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted:

- Hits report filed on a hydraulic fluid release from a tri-axle truck delivering caliche for the backfill test/situation addressed by the contractor.

TAILGATE TOPICS:

- Working over water, boat safety,
- Slip trips and fall,
- Discussed how cap material for Cap 2 will be deployed (techniques, boat safety, communication, anchoring, decon of anchors, if necessary,
- Heavy equipment safety,
- Weather, heat stress, hydration, biological hazards,
- Soil grading, including steep slope, near water work, strategy for backfill test,
- Barge personnel segregation from work when heavy equipment/construction is being used, PPE requirements,
- Both in English and Spanish

SAFE BEHAVIOR OBSERVATIONS: No formal SBOs documented today.

OPERATIONS / PRODUCTION REPORT

WORK FORCE – CONTRACTOR AND SUBCONTRACTOR

Company	Cumulative Total of Work Hours From Previous Report	Total Hours Today	Total Work Hours From Start of Construction
CH2MHILL			
Rick Gorsira	83	11	94
Stephanie DeWitt	32	11	43
Erick Sepulveda	32	11	43
George Hicks	32	11	43

Right Way Environmental			
Francisco Centero	32	11	43
Pedro Sanchez	32	11	43
Miguel Padilla	32	11	43
Pedro Tejada	32	11	43
Luis Rios	32	11	43
Angel Ortiz	32	11	43
Hector Santiago (Fuentes)	32	11	43
CSA			
Frank Johnson	32	11	43
Terry Stevens	32	11	43

EQUIPMENT ON HAND

Description of Equipment	Make/Model/Manufacturer	Equipment ID Number	Inspection Performed By
2-24Ft OB boat			ES/RG
12' OB Zodiac			ES/RG
14'Canoe			ES/RG
John Deere 780Excavator			ES
6022 Off road Forklift (6500lb)			ES
Canal survey equipment			ES
Support trailer			ES
Porta Jon			ES
Farm pro chain saw, STIHL(18")			ES
John Deere 450 HX (D-4)			ES

COMMENTS (acceptance status, inspection findings, etc.):

None

WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS

Performed Work / Test for Today: CSA set buoys at corner boundaries of Cap #2 test location, collected data from sampling stations (half barrels for groundwater flux and turbidity) in the canal, repaired southern most turbidity curtain, staged sand , and activated media and equipment on barge, completed ~70% of the backfill test, completed Cap #2 Pilot test. Collected the canal water samples to be analyzed for the presence of PAHs and TSS.

Planned Work / Test for Tomorrow: Collect GW flux and turbidity measurements, load sand onto barge, complete Cap #3 pilot test, complete Backfill test. Start de-mob process of the contractors.

Planned Work / Test for Next Week: None.

CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED (List any conflicts with the project [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:** None

VISITORS AND DISCUSSIONS: No visitors.

QUALITY CONTROL REPORT

MATERIALS DELIVERED TO JOB SITE

Quantity/Volume/Weight	Description of Materials Received	Make/Model/Manufacturer	Material Lot Number	Inspection Performed By
1-50X5'	Turbidity curtain, Type I			

1-100X 5’	Turbidity curtain Type I			
1-100X 12’	Turbidity curtain Type I			
80CMs	Sand			
72CMs	Caliche			
18 sheets	0.5” Ply score(4X8)			
1-100X15’	Manatee netting			
176 CMs	Caliche			
1-20X 4’	Turbidity curtain Type I			

COMMENTS (acceptance status, inspection findings, etc.): None.

INSPECTIONS PERFORMED

Task/Activity Inspected	Inspection Performed	Findings
Installation of turbidity curtains; last curtain (#3) found to need expansion to reach sides of canal and repaired, as well as the Northermost curtain (#1).	Visual	Acceptable
Site prep	Visual	Acceptable
Trackhoe inspection	Visual	Acceptable
D-4 Inspection	Visual	Acceptable

TESTS PERFORMED

Task/Activity Tested	Test Performed	Test Results (Pass/Fail) - Criteria
Canal water	Turbidity	Comparative
Gas ebullition	Mass/weight	Fail
Groundwater Flux	Mass/weight	Data recorded (not pass or fail)
Canal water	PAH/TSS	Completed pre-construction
Cap Profile depth	Bucket deposition measurement (inside)	Within range
Canal Water	PAH/TSS	Completed post Cap#1 construction

QUALITY ISSUES AND RESOLUTIONS: None.

SUBMITTALS INSPECTION / REVIEW

Submittal No.	Submittal Description	Specification/Plan Reference	Submittal Approved?		Comment/Reason/Action
		No new submittals.	Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	

REGULATORY COMPLIANCE REPORT

PERMIT INSPECTIONS PERFORMED: Sand/caliche stockpile inspections performed. Stockpiles on plastic sheeting and covered; secured with sandbags. Good condition.

WASTE ACCUMULATION/STOCKPILE AREA INSPECTION							
Inspection Performed By:		Erick Sepulveda		Signature of Inspector:	Erick Sepulveda		
Accumulation / Stockpile Area Inspected:		Yes					
No of Containers:	1	No of Tanks	0	No of Roll-Off Boxes:	0	No. of Drums	1(30 gallon open top)
Inspection Results: Hydraulic fluid with sorbent material less than 10 pounds							

GENERAL COMMENTS

General Comments~ (rework, directives, etc.): None.

ATTACHMENTS

List of Attachments: (examples, as applicable: submittals, meeting minutes, safety meeting minutes, COCs, weight tickets, manifests, profiles, rework item list, RFIs, DCNs, photographs, etc.):

- Photo log.

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first and last name on each completed daily report. This form may be filled out electronically and signed electronically.

Erick Sepulveda 03/01/2012

PREPARER'S SIGNATURE DATE

PHOTOGRAPHS

Subject/Description: View of Backfill test area looking from access point West towards canal. Photo Log No: 030	
Subject/Description: View of Backfill test area looking west into canal. Settlement gauge in view. Photo Log No: 031	
Subject/Description: Track hoe moving bag of AquaBlok for distribution over Cap 2 area. Photo Log No: 032	
Subject/Description: Extended bucket of track hoe placing AquaBlok material. Photo Log No: 033	
Subject/Description: Depth of material measurement bucket for Cap 2. View is of bucket from NW area of Cap 2. Photo Log No: 034	

DAILY REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

SOP ES-P6-01, Final, Rev 1

CONTRACT NAME:	SWMU 5 Pilot Study Cooling Water Canal	REPORT NO:	005
CONTRACT NUMBER:		REPORT DATE:	03-02-2012
REVISION NUMBER:		REVISION DATE: djl	03-05-2012
TASK ORDER NUMBER:	01.FA	PROJECT NAME / LOCATION:	Cooling Water Canal
PROJECT NUMBER:	199918	PROJECT DESCRIPTION:	Pilot Study
PROJECT MANAGER:	David Lane	FIELD QUALITY MANAGER:	Stephanie DeWitt
CONSTRUCTION MANAGER:	Erick Sepulveda	SITE SAFETY COORDINATOR:	Rick Gorsira

AM WEATHER:	Sunny, clear, warm.	PM WEATHER:	Sunny, Clear, Hot with light breeze	MAX TEMP (F):	92	MIN TEMP (F):	72

SUMMARY OF WORK PERFORMED TODAY

0700 to 0725 Daily Safety Meeting, STAC completion with CH field team, OMI, Right Way Environmental Co (RWEC), and CSA

0725 Crews head out:

CSA set buoys at corner boundaries of Cap #3 test location,

Collected data from sampling stations (half barrels for groundwater flux and turbidity) in the canal,

Collected canal water samples for PAHs and TSS,

Sand was loaded onto the barge for Cap #3Pilot Test,

Continued with Backfill test, completed backfill placement,

Completed Cap #3 Pilot Test,

Began Clean up, restoration and Demob.

1730 CSA and RWEC offsite

1830 CH off site.

HEALTH AND SAFETY REPORT

SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED (Include Observations, Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted:

None

TAILGATE TOPICS:

- Complacency…last day of work and Friday syndrome,
- Working over water, boat safety,
- Slip trips and fall,
- Discussed how cap material for Cap 3 will be deployed (techniques, boat safety, communication, anchoring, decon of anchors, if necessary,
- Heavy equipment safety,
- Weather, heat stress, hydration, biological hazards,
- Soil grading, including steep slope, near water work, strategy for backfill test,
- Barge personnel segregation from work when heavy equipment/construction is being used, PPE requirements,
- Both in English and Spanish

SAFE BEHAVIOR OBSERVATIONS: No formal SBOs documented today.

OPERATIONS / PRODUCTION REPORT

WORK FORCE – CONTRACTOR AND SUBCONTRACTOR

Company	Cumulative Total of Work Hours From Previous Report	Total Hours Today	Total Work Hours From Start of Construction
CH2MHILL			
Rick Gorsira	94	11	105
Stephanie DeWitt	43	11	54
Erick Sepulveda	43	11	54

George Hicks	43	11	54
Right Way Environmental			
Francisco Centero	43	11	54
Pedro Sanchez	43	11	54
Miguel Padilla	43	11	54
Pedro Tejada	43	11	54
Luis Rios	43	11	54
Angel Ortiz	43	11	54
Hector Santiago (Fuentes)	43	11	54
CSA			
Frank Johnson	43	11	54
Terry Stevens	43	11	54

EQUIPMENT ON HAND

Description of Equipment	Make/Model/Manufacturer	Equipment ID Number	Inspection Performed By
2-24Ft OB boat			ES/RG
12' OB Zodiac			ES/RG
14'Canoe			ES/RG
John Deere 160 Excavator[OFF SITE]			ES
6022 Off road Forklift (6500lb)			ES
Canal survey equipment			ES
Support trailer			ES
Porta Jon			ES
Farm ptro chain saw, STIHL(18")			ES
John Deere 450 HX (D-4) [OFF SITE]			ES

COMMENTS (acceptance status, inspection findings, etc.):

None

WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS

Performed Work / Test for Today: CSA set buoys at corner boundaries of Cap #3 test location, collected data from sampling stations (half barrels for groundwater flux and turbidity) in the canal, staged sand on barge, completed backfill test, completed Cap #3 Pilot test. Collected the canal water samples to be analyzed for the presence of PAHs and TSS.

Site cleanup and Demob process began for RWEC and CSA.

Planned Work / Test for Tomorrow: CSA Demob

Planned Work / Test for Next Week: RWEC clean up, restoration (including removing backfill to grade on bank of backfill area) and Demob (Monday and Tuesday).

CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED (List any conflicts with the project [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:** None

VISITORS AND DISCUSSIONS: No visitors.

QUALITY CONTROL REPORT

MATERIALS DELIVERED TO JOB SITE

Quantity/Volume/Weight	Description of Materials Received	Make/Model/Manufacturer	Material Lot Number	Inspection Performed By
1-50X5’	Turbidity curtain, Type I			
1-100X 5’	Turbidity curtain Type I			
1-100X 12’	Turbidity curtain Type I			
80CMs	Sand			
18 sheets	0.5” Ply score(4X8)			
1-100X15’	Manatee netting			
176 CMs	Caliche (389.75 CMs total)			
1-20X 4’	Turbidity curtain Type I			
50 LF	Silt fence			

COMMENTS (acceptance status, inspection findings, etc.): None.

INSPECTIONS PERFORMED

Task/Activity Inspected	Inspection Performed	Findings
Inspection of turbidity curtains.	Visual	Acceptable
Site prep	Visual	Acceptable
Trackhoe inspection	Visual	Acceptable
D-4 Inspection	Visual	Acceptable
Backfill test	Visual	Acceptable
SPCC	Visual	Acceptable

TESTS PERFORMED

Task/Activity Tested	Test Performed	Test Results (Pass/Fail) - Criteria
Canal water	Turbidity	Comparative
Gas ebullition	Mass/weight	Fail
Groundwater Flux	Mass/weight	Data recorded (not pass or fail)
Canal water	PAH/TSS	Completed pre-construction
Cap Profile depth	Bucket deposition measurement (inside)	Within range
Canal Water	PAH/TSS	Completed post Cap#1 construction
Canal Water	PAH/TSS	Completed post Cap #3 construction

QUALITY ISSUES AND RESOLUTIONS: None.

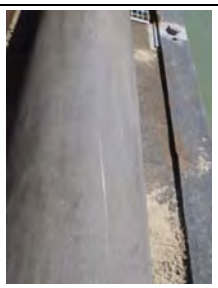
SUBMITTALS INSPECTION / REVIEW

Submittal No.	Submittal Description	Specification/Plan Reference	Submittal Approved?		Comment/Reason/Action
		No new submittals.	Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	

REGULATORY COMPLIANCE REPORT							
PERMIT INSPECTIONS PERFORMED: Sand/caliche stockpile inspections performed. Stockpiles on plastic sheeting and covered; secured with sandbags. Good condition.							
WASTE ACCUMULATION/STOCKPILE AREA INSPECTION							
Inspection Performed By:		Erick Sepulveda		Signature of Inspector:	Erick Sepulveda		
Accumulation / Stockpile Area Inspected:		Yes					
No of Containers:	3	No of Tanks	0	No of Roll-Off Boxes:	0	No. of Drums	1(55 gallon open top) Non-Haz, 2 – 55 gallon open top Haz Waste
Inspection Results: 2-55 gallon open-top drums with PPE, wipe pads for decon, and contaminated plastic materials; 1-55 gallon drum with hydraulic fluid with sorbent material (less than 10 pounds). Drums secured and labeled.							
GENERAL COMMENTS							
General Comments~ (rework, directives, etc.): None.							
ATTACHMENTS							
List of Attachments: (examples, as applicable: submittals, meeting minutes, safety meeting minutes, COCs, weight tickets, manifests, profiles, rework item list, RFIs, DCNs, photographs, etc.): • Photo log.							
NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first and last name on each completed daily report. This form may be filled out electronically and signed electronically.		***Erick Sepulveda***				03/02/2012	
		PREPARER'S SIGNATURE				DATE	

PHOTOGRAPHS

Subject/Description: View of Turbidity curtain # 3 (orange) and Manatee net (light yellow line at middle right of photo). Looking SE in canal.	
Photo Log No: 035	
Subject/Description: Depth of sand in buckets at conclusion of sand placement at Cap #3.	
Photo Log No: 036	
Subject/Description: Backfill Test area with settlement gauge mud wall. Looking west.	
Photo Log No: 037	
Subject/Description: Close up of mud wall created by backfill test. Base of settlement gauge in upper right. Looking west.	
Photo Log No: 038	
Subject/Description: View of Backfill test looking north from vehicle bridge.	
Photo Log No: 039	

Subject/Description: Dripolene/sediment on spud at Cap #3. Looking south.	
Photo Log No: 040	
Subject/Description: View of spud following decon.	
Photo Log No: 041	

DAILY REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

SOP ES-P6-01, Final, Rev 1

CONTRACT NAME:	SWMU 5 Pilot Study Cooling Water Canal	REPORT NO:	006
CONTRACT NUMBER:		REPORT DATE:	03-05-2012
REVISION NUMBER:		REVISION DATE: djl	03-08-2012
TASK ORDER NUMBER:	01.FA	PROJECT NAME / LOCATION:	Cooling Water Canal
PROJECT NUMBER:	199918	PROJECT DESCRIPTION:	Pilot Study
PROJECT MANAGER:	David Lane	FIELD QUALITY MANAGER:	Stephanie DeWitt
CONSTRUCTION MANAGER:	Erick Sepulveda	SITE SAFETY COORDINATOR:	Rick Gorsira

AM WEATHER:	Sunny, clear, warm.	PM WEATHER:	Sunny, Clear, Hot	MAX TEMP (F):	90	MIN TEMP (F):	72

SUMMARY OF WORK PERFORMED TODAY

0700 to 0725 Daily Safety Meeting, STAC completion with OMI personnel, Right Way Environmental Co (RWEC)

0725 Crews head out:

RWEC disconnects turbidity curtain, to allow egress of barge,

Barge removed…Off site,

Turbidity curtain and manatee netting, re-connected.

Containerized waste and labeled (two Haz waste with PPE and contaminated plastic materials, One with the hydraulic oil sweep material) moved to the plant (WWTP),

Continued clean up, restoration and Demob.

1600RWEC offsite

HEALTH AND SAFETY REPORT

SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED (Include Observations, Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted:

None

TAILGATE TOPICS:

- Complacency…last day of work and Friday syndrome,
- Working over water, boat safety,
- Slip trips and fall,
- Heavy equipment safety,
- Weather, heat stress, hydration, biological hazards,
- Soil grading, including steep slope, near water work, access road removal,
- Mostly Spanish

SAFE BEHAVIOR OBSERVATIONS: No formal SBOs documented today.

OPERATIONS / PRODUCTION REPORT

WORK FORCE – CONTRACTOR AND SUBCONTRACTOR

Company	Cumulative Total of Work Hours From Previous Report	Total Hours Today	Total Work Hours From Start of Construction
CH2MHILL			
Rick Gorsira	105	0	105
Stephanie DeWitt	54	0	54
Erick Sepulveda	54	0	54
George Hicks	54	0	54

Right Way Environmental			
Francisco Centero	54	8	62
Pedro Sanchez	54	8	62
Miguel Padilla	54	8	62
Pedro Tejada	54	0	54
Luis Rios	54	8	62
Angel Ortiz	54	8	62
Hector Santiago (Fuentes)	54	8	62
CSA			
Frank Johnson	54	0	54
Terry stevens	54	0	54

EQUIPMENT ON HAND

Description of Equipment	Make/Model/Manufacturer	Equipment ID Number	Inspection Performed By
2-24Ft OB boat[OFF SITE]			ES/RG
12' OB Zodiac			ES/RG
14'Canoe(OMI)			ES/RG
John Deere 160 Excavator[OFF SITE]			ES
6022 Off road Forklift (6500lb)			ES
Canal survey equipment[OFF SITE]			ES
Support trailer			ES
Porta Jon			ES
Farm pro chain saw, STIHL(18")			ES
John Deere 450 HX (D-4) [OFF SITE]			ES

COMMENTS (acceptance status, inspection findings, etc.):

None

WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS

Performed Work / Test for Today: Continue Site cleanup and Demob process began for RWEC. Removal of barge.

Planned Work / Test for Tomorrow: Complete cleanup and Demob.

Planned Work / Test for Next Week: RWEC-stand by for the removal of the turbidity curtains and Manatee netting

CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED (List any conflicts with the project [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:** None

VISITORS AND DISCUSSIONS: No visitors.

QUALITY CONTROL REPORT

MATERIALS DELIVERED TO JOB SITE

Quantity/Volume/Weight	Description of Materials Received	Make/Model/Manufacturer	Material Lot Number	Inspection Performed By
1-50X5'	Turbidity curtain, Type I			
1-100X 5'	Turbidity curtain Type I			
1-100X 12'	Turbidity curtain Type I			

80CMs	Sand			
389.75 CMs (total)	Caliche			
18 sheets	0.5” Ply score(4X8)			
1-100X15’	Manatee netting			
176 CMs	Caliche			
1-20X 4’	Turbidity curtain Type I			
50 LF	Silt fence			

COMMENTS (acceptance status, inspection findings, etc.): None.

INSPECTIONS PERFORMED

Task/Activity Inspected	Inspection Performed	Findings
Installation of turbidity curtains; last curtain (#3) found to need expansion to reach sides of canal and repaired, as well as the Northermost curtain (#1).	Visual	Acceptable
Site prep	Visual	Acceptable
Trackhoe inspection	Visual	Acceptable
D-4 Inspection	Visual	Acceptable
Backfill test	Visual	Acceptable
SPCC	Visual	Acceptable

TESTS PERFORMED

Task/Activity Tested	Test Performed	Test Results (Pass/Fail) - Criteria
Canal water	Turbidity	Comparative
Gas ebullition	Mass/weight	Fail
Groundwater Flux	Mass/weight	Data recorded (not pass or fail)
Canal water	PAH/TSS	Completed pre-construction
Cap Profile depth	Bucket deposition measurement (inside)	Within range
Canal Water	PAH/TSS	Completed post Cap#1 construction
Canal Water	PAH/TSS	Completed post Cap #3 construction

QUALITY ISSUES AND RESOLUTIONS: None.

SUBMITTALS INSPECTION / REVIEW

Submittal No.	Submittal Description	Specification/Plan Reference	Submittal Approved?		Comment/Reason/Action
		No new submittals.	Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	

REGULATORY COMPLIANCE REPORT

PERMIT INSPECTIONS PERFORMED: Sand/caliche stockpile inspections performed. Stockpiles on plastic sheeting and covered; secured with sandbags. Good condition.

WASTE ACCUMULATION/STOCKPILE AREA INSPECTION

Inspection Performed By:	Erick Sepulveda	Signature of Inspector:	Erick Sepulveda

Accumulation / Stockpile Area Inspected:		Yes					
No of Containers:	3	No of Tanks	0	No of Roll-Off Boxes:	0	No. of Drums	1-55 gallon open top NON-HAZ WASTE, 2 – 55 gallon open top HAZ WASTE

Inspection Results: 1-Hydraulic fluid with sorbent material less than 10 pounds, 2-with PPE, wipe rags, plastic materials

GENERAL COMMENTS

General Comments~ (rework, directives, etc.): None.

ATTACHMENTS

List of Attachments: (examples, as applicable: submittals, meeting minutes, safety meeting minutes, COCs, weight tickets, manifests, profiles, rework item list, RFIs, DCNs, photographs, etc.):

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first and last name on each completed daily report. This form may be filled out electronically and signed electronically.

Erick Sepulveda 03/05/2012

PREPARER'S SIGNATURE DATE

DAILY REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

SOP ES-P6-01, Final, Rev 1

CONTRACT NAME:	SWMU 5 Pilot Study Cooling Water Canal	REPORT NO:	007
CONTRACT NUMBER:		REPORT DATE:	03-06-2012
REVISION NUMBER:		REVISION DATE: djl	03-08-2012
TASK ORDER NUMBER:	01.FA	PROJECT NAME / LOCATION:	Cooling Water Canal
PROJECT NUMBER:	199918	PROJECT DESCRIPTION:	Pilot Study
PROJECT MANAGER:	David Lane	FIELD QUALITY MANAGER:	Stephanie DeWitt
CONSTRUCTION MANAGER:	Erick Sepulveda	SITE SAFETY COORDINATOR:	Rick Gorsira

AM WEATHER:	Sunny, clear, warm.	PM WEATHER:	Sunny, Clear, Hot	MAX TEMP (F):	90	MIN TEMP (F):	71

SUMMARY OF WORK PERFORMED TODAY

0700 to 0725 Daily Safety Meeting, STAC completion with OMI personnel, Right Way Environmental Co (RWEC)

0725 Crews head out:

Removed access road to the backfill test,

Re-installed chain-linked fence,

Turbidity curtain and manatee netting intact,

Cleanup-straightened out stock piles (sand and caliche),

Completed clean up, restoration and Demob.

1400RWEC offsite

HEALTH AND SAFETY REPORT

SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED (Include Observations, Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted:

None

TAILGATE TOPICS:

- Complacency…last day of work and Friday syndrome,
- Working over water, boat safety,
- Slip trips and fall,
- Heavy equipment safety,
- Weather, heat stress, hydration, biological hazards,
- Soil grading, including steep slope, near water work, access road removal,
- Mostly Spanish

SAFE BEHAVIOR OBSERVATIONS: No formal SBOs documented today.

OPERATIONS / PRODUCTION REPORT

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Company	Cumulative Total of Work Hours From Previous Report	Total Hours Today	Total Work Hours From Start of Construction
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Right Way Environmental			

Francisco Centero	62	4	66
Pedro Sanchez	62	4	66
Miguel Padilla	62	4	66
Pedro Tejada	54	0	54
Luis Rios	62	4	66
Angel Ortiz	62	4	66
Hector Santiago (Fuentes)	62	4	66
CSA			
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EQUIPMENT ON HAND

Description of Equipment	Make/Model/Manufacturer	Equipment ID Number	Inspection Performed By
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12' OB Zodiac			ES/RG
14'Canoe(OMI)			ES/RG
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Canal survey equipment[OFF SITE]			ES
Support trailer[OFF SITE]			ES
Porta Jon[OFF SITE]			ES
Farm pro chain saw, STIHL(18")[OFF SITE]			ES
John Deere 450 HX (D-4) [OFF SITE]			ES

COMMENTS (acceptance status, inspection findings, etc.):

None

WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS

Performed Work / Test for Today: Final Site cleanup and Demob process completed for RWEC.

Planned Work / Test for Tomorrow: None

Planned Work / Test for Next Week: None/RWEC on call for the removal of the turbidity curtain and Manatee netting

CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED (List any conflicts with the project [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:** None

VISITORS AND DISCUSSIONS: No visitors.

QUALITY CONTROL REPORT

MATERIALS DELIVERED TO JOB SITE

Quantity/Volume/Weight	Description of Materials Received	Make/Model/Manufacturer	Material Lot Number	Inspection Performed By
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80CMs	Sand			

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176 CMs	Caliche			
1-20X 4’	Turbidity curtain Type I			
50 LF	Silt fence			

COMMENTS (acceptance status, inspection findings, etc.): None.

INSPECTIONS PERFORMED

Task/Activity Inspected	Inspection Performed	Findings
Installation of turbidity curtains; last curtain (#3) found to need expansion to reach sides of canal and repaired, as well as the Northermost curtain (#1).	Visual	Acceptable
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Trackhoe inspection	Visual	Acceptable
D-4 Inspection	Visual	Acceptable
Backfill test	Visual	Acceptable
SPCC	Visual	Acceptable

TESTS PERFORMED

Task/Activity Tested	Test Performed	Test Results (Pass/Fail) - Criteria
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Cap Profile depth	Bucket deposition measurement (inside)	Within range
Canal Water	PAH/TSS	Completed post Cap#1 construction
Canal Water	PAH/TSS	Completed post Cap #3 construction

QUALITY ISSUES AND RESOLUTIONS: None.

SUBMITTALS INSPECTION / REVIEW

Submittal No.	Submittal Description	Specification/Plan Reference	Submittal Approved?		Comment/Reason/Action
		No new submittals.	Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	

REGULATORY COMPLIANCE REPORT

PERMIT INSPECTIONS PERFORMED: Sand/caliche stockpile inspections performed. Stockpiles on plastic sheeting and covered; secured with sandbags. Good condition.

WASTE ACCUMULATION/STOCKPILE AREA INSPECTION							
Inspection Performed By:		Erick Sepulveda		Signature of Inspector:	Erick Sepulveda		
Accumulation / Stockpile Area Inspected:		Yes					
No of Containers:	3	No of Tanks	0	No of Roll-Off Boxes:	0	No. of Drums	1-55 gallon open top NON-HAZ WASTE, 2 – 55 gallon open top HAZ WASTE
Inspection Results: 1-Hydraulic fluid with sorbent material less than 10 pounds, 2-with PPE, wipe rags, plastic materials							

GENERAL COMMENTS

General Comments~ (rework, directives, etc.): None.

ATTACHMENTS

List of Attachments: (examples, as applicable: submittals, meeting minutes, safety meeting minutes, COCs, weight tickets, manifests, profiles, rework item list, RFIs, DCNs, photographs, etc.):

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Erick Sepulveda 03/06/2012

PREPARER'S SIGNATURE DATE

Table D4-2

DAILY SURFACE WATER FIELD TURBIDITY READING LOG (NTUs)

DOW PTPLLC CWC Phase II Pilot Study

S1 S2 S2 S3 S3 S4

Date	Time	TURBIDITY CURTAIN #1		TURBIDITY CURTAIN #2		TURBIDITY CURTAIN NO.3	
		Upstream	Downstream	Upstream	Downstream	Upstream	Downstream
							NOT TO EXCEED BACKGROUND OR 50 NTUs-STOP WORK IF EXCEEDED #3
2/23/12	1020	12.6					
	1035		13.0	13.0			
	1055			~~13.08~~	12.7	12.7	
	1115						16.7
2/28/12	1415	25.2					
	1420		17.2	17.2			
	1422				5.36	5.36	
	1427						6.70
2/29/12	1242	37.3					
	1245		10.9	10.9			
	1254				7.1	7.1	
	1258						5.41
3/1/12	1140	31.6					
	1050		7.41	7.41			
	1102				6.36	6.36	
	1120						6.29
3/1/12	1646	21.2					
	1642		38.7	38.7			
	1637				7.58	7.58	
	1635						9.32